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HYOSCYAMUS CULTIVATED IN MINNESOTA: MOISTURE, ASH AND ALKALOIDAL CONTENT.*

By E. L. Newcomb and M. H. Haynes.

During the past few years various species of Hyoscyamus have been cultivated in the Medicinal Plant Garden, College of Pharmacy, University of Minnesota, chiefly for the purpose of increasing the educational facilities of the college. Methods of culture and the growth of the plants have been studied, samples of the drug Hyoscyamus have been prepared from the different varieties, and these samples have been examined with reference to ash and total alkaloidal content.

The plants yielding the samples reported upon in this paper were propagated by sowing the seed in seed-pans in the plant-house, transplanting the seedlings to flats, then small pots, and later, when danger of frost was over, to plots in the open garden. The plants of the annual varieties were placed about fifteen inches apart in the plots, while those of the biennial variety were planted about twenty inches apart each way. The soil of the garden plots in each case was composed of a light sandy loam mixed with considerable humus.

Germination and cultural data have been given in an earlier paper by one of us, but the following additional data may be of value to those who are interested in the culture of Hyoscyamus. It has been found that a satisfactory germination of the seed of *Hyoscyamus niger* biennial may be obtained by treating the seed with concentrated sulphuric acid. The method which has thus far given the best results has been that of placing the seed in a porcelain dish, adding concentrated sulphuric acid, and stirring with a glass rod for two and a half minutes, after which the seed are immediately thrown onto a coarse screen and thoroughly washed with water. We have found biennial henbane seed treated in this manner to give a fairly uniform germination within twelve to fifteen days. Untreated seed of the biennial henbane, in our experience, requires a very variable length of time to germinate.

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* Read before the American Chemical Society, Division of Pharmaceutical Chemistry, Seattle, Wash., September, 1915.

The growing plants of both the annual and biennial varieties of Hyoscyamus are very susceptible to attack by the Colorado potato beetle (*Dorophora decemlineata*). We have been able to readily control this enemy by the application, early in the season, of Paris green or other arsenical poison, either as a spray or dusted dry upon the plants.

Further experiments to determine the constancy of *Hyoscyamus niger* biennial have led this summer (1915) to the discovery of two specimens of known biennial origin which are completing their cycle of growth in one season. These two plants are among about five hundred of the biennial type under culture, and were not to be distinguished from the other plants during the first three months of their growth. The latter part of August these two specimens developed heavy branching stalks bearing yellow flowers with purplish veins, and being in every way characteristic of the second year's growth of the biennial henbane. We are unable to explain why these two specimens have developed as annual plants, but offer, as a possible explanation, the unusual low temperature of the growing season, the early germination of the seed (February), and the abundance of plant food. The discovery of the two specimens indicates that there are at least races of the biennial *Hyoscyamus niger* which possess the semi-latent capacity of growing as annuals.

Samples for moisture, ash and alkaloidal determinations were collected from the annual varieties, June 28, and from the first year's growth of the biennial form on July 20. The samples of the annual varieties consisted of the flowering tops, about 10 cm. in length, with a maximum stem diameter of not over 5 mm., each bearing from two to four flowers and a few immature fruits. Two samples from the biennial plants represented, first, basal leaves without the large fleshy petioles, and, second, the petioles alone. All samples were carefully cleaned from adhering sand, weighed, and dried at a temperature of from 60° to 80° C.

The following table gives the results of the moisture, ash and alkaloidal determinations:

Description of sample	Per cent. H_2O lost on drying	Per cent. total ash	Per cent. total alkaloid, U. S. P. IX method
Hyoscyamus niger biennial, lamina only, first year	87.4	14.07 14.2 14.5 14.8	0.0896 0.0896
Hyoscyamus niger biennial, petioles only, first year	91.6	18.9 18.8	0.0896 0.1012
Hyoscyamus niger annual, flowering tops	85.06	11.66 11.41	0.1561 0.1301
Hyoscyamus pallidus, flowering tops	84.8	12.33 11.09	0.1301 0.1243

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A COMPARISON OF THE RESULTS SECURED BY THE USE OF THE GUINEA-PIG AND CAT METHODS FOR THE ASSAY OF TINCTURE OF ACONITE.

By Charles C. Haskell and H. B. Thomas.

A considerable amount of evidence has been adduced, tending to show that the chemical method of assay for aconite is unreliable.[1], [2], [3], [4], [5] Such being the case, if the drug is to be used in the treatment of disease, the effort should be made to decide upon a satisfactory method of physiological assay and insist upon its employment until a reliable chemical method can be discovered.

Roth's investigations [6] seemed to prove that the guinea-pig method was quite satisfactory, but several possible sources of error were not considered in his paper. First, is the resistance of guinea-pigs to poisoning by aconite constant and not subject to seasonal variation? This is a point that should be determined, because it has been shown that season plays an important rôle in regard to the resistance of guinea-pigs to poisoning by other substances. It is also possible that certain samples of tincture of aconite may contain substances which delay or prevent the absorption of the aconitine when the sample is injected subcutaneously. It is well known that fluidextract of *Cannabis indica* has no apparent systemic action when injected subcutaneously, and the same may be true, to a certain extent, with regard to tinctures of aconite made from certain lots of drug or according to some modified technic.

With these facts in mind, Ford and Wine[7] compared the results secured by the use of the guinea-pig and the cat methods for the assay of tincture of aconite. From their work, it seemed that the two methods gave concordant results when applied to some samples, but discordant when other samples were tested by both methods. In carrying out the tests on guinea-pigs, they subjected their tinctures to a moderate amount of heat, and this may have had the effect of bringing about some decomposition. It seemed desirable, therefore, to investigate the methods still further, and endeavor to ascertain whether certain definite sources of error existed in either.

Nine samples of tincture of aconite were procured. Eight of these were tested upon guinea-pigs and eight were tested upon cats, seven, therefore, being tested by both methods.

In carrying out the tests on guinea-pigs, the tinctures were diluted in the proportion of one part of tincture to three parts of normal saline; the dose was calculated per gramme body weight, and the injection made subcutaneously with a Record syringe. The pigs were observed at intervals during twenty-four hours, and note made at the end of that time as to those surviving and those dying. The following results were obtained:

TABLE I.

Sample	Minimum lethal dose for guinea-pigs in Cc. tincture per gramme body weight	Ratio
Tincture A	.00033	1
Tincture B	.00065	1.97
Tincture C	.00065	1.97
Tincture D	.00150	4.54
Tincture E	.00200	6.16
Tincture F	.00220	6.66
Tincture G	.00240	7.27
Tincture H	.00250	7.57

In testing by the cat method, the samples were diluted in the proportion of one part of tincture to nine parts of physiological salt solution. The animals were etherized, the femoral vein exposed, a cannula inserted, and the diluted tincture injected from a burette. The object was to inject the lethal dose over a period of sixty minutes, but the time factor seemed relatively unimportant. The ether was discontinued as soon as the injection of aconite was started. Eight samples were tested by this method. The results are given in Table II.

TABLE II.

Sample	Lethal dose for cats in Cc. Tincture per gramme body weight	Ratio
Tincture A	.000480	1
Tincture B	.001589	3.25
Tincture C	.002034	4.17
Tincture D	.001026	2.10
Tincture F	.002814	5.76
Tincture G	.003420	7
Tincture H	.003848	7.88
Tincture J	.001852	3.79

It is evident, from a consideration of these tables, that the two methods do not give identical results. This can be more readily appreciated from Table III.

TABLE III.

Sample	Guinea-pig ratio	Cat ratio
Tincture A	1	1
Tincture B	1.97	3.25
Tincture C	1.97	4.17
Tincture D	4.54	2.10
Tincture F	6.16	5.76
Tincture G	6.66	7
Tincture H	7.27	7.88

By both methods, Sample A is the strongest and Sample H is the weakest. By the guinea-pig method, Sample B is more than twice as active as Sample D, while by the cat method the latter is stronger than the former.

Why should this discrepancy exist? Both methods depend on the determination of the lethal dose, and, since the activity of aconite is due, probably, to the contained aconitine, it would seem that the ratio of strength between two different samples should be the same as determined by the two methods.

It became apparent early in the experiments upon the cats that considerable individual variations in resistance to aconite poisoning existed. This is well illustrated by the following protocol:

SAMPLE C.

Weight of cat in grammes	Lethal dose per gramme body weight	Sex
2070	.00129	Female
2700	.00499	Female
2500	.00540	Female
3100	.00064	Male
3100	.00151	Female
2320	.00116	Male
2600	.00083	Female
2500	.00439	Male

At first glance these figures are far from encouraging. Thus it is seen that cat No. 4 succumbed to a dose of 0.00064, while 0.00540, more than eight times as much, was required for cat No. 3. It will be noted that cat No. 4 was a male, while cat No. 3 was a female. If males and females are grouped separately, it is evident that the average lethal dose for the latter is much greater than for the former.

TABLE IV.

Sample	Average lethal dose for male cats	Average lethal dose for females
Tincture A	.000267	.00062
Tincture B	.000611	.00232
Tincture C	.000743	.00280
Tincture D	.000823	.00130
Tincture F	.00217	.00378
Tincture G	.00272	.00462
Tincture H	.00216	.00511
Tincture J	Insufficient number of animals	

If now we compare the results secured by the use of cats of one sex with the results secured by the use of the guinea-pig test, it is seen that closer agreements with the guinea-pig results are obtained.

TABLE V.

Sample	Male cat ratio	Guinea-pig ratio	Female cat ratio
Tincture A	1	1	1
Tincture B	2.28	1.97	3.74
Tincture C	2.80	1.97	4.51
Tincture D	3.08	4.54	2.09
Tincture F	8.12	6.66	6.09
Tincture G	10.16	7.27	7.45
Tincture H	8.09	7.57	8.24

Even in this table, however, there are certain discrepancies. Thus, acording to the guinea-pig tests, Tincture G is slightly more potent than Tincture H, while by the male cat tests the reverse relation is evident. By the guinea-pig test, Tincture C is more than twice as strong as Tincture D, while by the female cats Tincture D is decidedly the more active of the two. It is probable that these discrepancies are due to the fact that not enough animals were run on these particular samples.

Not only are the female cats more resistant than the males, but the reaction of the former is much more variable than that of the latter. This is not due to the fact that the females were lactating or pregnant, which, as pointed out by Hatcher, plays an important rôle in influencing the resistance of cats to digitalis poisoning, for we included no lactating or pregnant animals in our series.

Even when the tests with aconite were carried out on cats of one sex, we were not able to obtain the accurate results that the cat method had yielded in Dr. Hatcher's and in our own hands. It will occasionally happen that two or three cats succumb to almost exactly the same dose of aconite, but rather large individual variations are the rule. We do believe, however, that, in the present state of uncertainty in regard to the guinea-pig test, the cat method will prove a valuable means of checking the results secured by the former, and further use may prove it to possess decided advantages over the guinea-pig method.

Summary and Conclusions.

1. It has been shown that the cat method of Hatcher can be used with good results in the attempt to ascertain the strength of samples of tincture of aconite.

2. Female cats are more resistant and show greater individual variations to the toxic action of aconite than do male cats.

3. That absorption of aconite apparently occurs readily from the subcutaneous tissues of guinea-pigs.

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THE STANDARDIZATION OF DRUGS BY THE USE OF PLANTS.

By W. M. Saylor.

In taking up this subject I realize that it is one which had some consideration in America about fifteen years ago, and one might think that it has since lost favor and has been looked upon as unworthy of any further consideration. Some experiments to determine the action of toxic substances on plants were performed in Germany as early as 1893. Under the subject, "The Toxic Action of Dissolved Salts and Their Electrolytic Dissociation," Doctors True and Kahlenberg published, in the *Botanical Gazette,* vol. xxii, year 1896, the results of their experiments on the seedling plants *Lupinus albus.* Their work was physiological and with the view of determining the maximum strength solution in which the seedlings would live. Doctor F. D. Heald, of the Wisconsin University, published in the same volume of the *Botanical Gazette,* under the subject, "The Toxic Effects of Dilute Solutions of Acids and Salts upon Plants," the results of experiments made with seedlings of *Zea Mays, Cucurbita Pepo, Pisum sativum,* and *Lupinus albus.* Doctor Heald's results were largely corroborative of those obtained by Doctors True and Kahlenberg.

The first attempt made in America to determine the toxicity or therapeutic activity of drugs by the use of plants was made by Professor Kraemer. The results of his work were published in the American Journal of Pharmacy in October, 1900. In that article Professor Kraemer mentions quite a number of plants that had been used by other experimenters.

In my experiments I used seedlings of the following: *Zea Mays, Pisum sativum, Phaseolus vulgaris,* and *Lupinus albus. Pisum sativum* and *Lupinus albus* were the only ones that gave satisfactory results, most of the experiments being performed with *Lupinus albus.*

Technic.—The seeds of the plants were soaked in water for twenty-four hours, then placed upon moist sphagnum in a dark place, at a temperature of from 18° to 20° C., and allowed to germinate. When the radicles reached a length of from twenty-five to forty millimetres they were marked, twenty millimetres from their tips, with indelible water-proof India ink.

Ordinary jelly glasses were used as containers, and fifty cubic centimetres of each solution used. Flat pieces of cork, about three by four inches, were used as covers for the glasses. One piece of cork was used to cover two glasses, and was placed so that each of two opposite corners of the cork was about over the centre of the container. A small glass rod was placed through each of these two corners. The lower end of this rod passed through an ordinary No. 6 cork which contained four staples used as carriers for four growing radicles. Hence four radicles were growing in each solution.

The seedlings were suspended so that the radicle passed through the staple and just the growing tip reached below the surface of the solution.

Every plant radicle was measured at the end of twenty-four and forty-eight hours respectively and the amount of growth recorded.

Various strength solutions of the following substances were used: Of strychnine sulphate, $^1/_{30}$ grain, $^1/_{20}$ grain, $^1/_{15}$ grain, $^1/_{12}$ grain, $^1/_{10}$ grain, $^1/_5$ grain, and then increasing by fifths on up to two grains in 50 Cc. of distilled water, were used. Of strychnine nitrate the same dilutions were made.

With both salts the $1^4/_5$-grain solution killed in twenty-four hours and the radicle did not advance in length a fraction of a millimetre, while in the $1^3/_5$-grain solution there was a growth of from one-half to one millimetre, and in the two-grain solution the radicle had shrunk and did not measure the original twenty millimetres from the mark.

In the table on page 10 is given a record of growth of seedlings in the solution of strychnine nitrate, for the first twenty-four hours. The original work contained twenty-two tables of this kind.

This table shows, as did all others, that more or less irregular growths are obtained in the weaker dilutions, while nearer the toxic point a gradual decline in activity and growth is noticed, while the toxic point is definite.

A comparison of the strychnine tables with those of distilled water showed that strychnine first stimulated the growth of the plant, but as the solutions grew stronger the plant weakened, the ultimate result being the death of the plant, just as is the case with animals.

For each toxic substance there is a definite point in strength beyond which the seedling plant under the influence of that substance will not grow or live.

Other substances used were as follows: Ethyl alcohol in dilutions of 5, 6, 7, 8, 9, and 10 per cent. Alcohol, U. S. P., 8 per cent., was toxic in twenty-four hours; *i.e.,* the radicle had not advanced in growth. Various dilutions of tincture of nux vomica, U. S. P., were used. Seven Cc. tincture in 50 Cc. distilled water killed in twenty-four hours. Two and one-half cubic centimetres of fluidextract of digitalis, U. S. P. VIII (Wyeth), in 50 Cc. water, were toxic in twenty-four hours.

The following is a record of the toxic points of the various substances used:

Tincture of digitalis made from preceding fluidextract: 8 Cc. of the tincture diluted with 50 Cc. of distilled water were toxic.

STRYCHNINE NITRATE.

Temperature, 18° to 20° C. First Twenty-four Hours.

Amount of strychnine nitrate in 50 Cc. of solution	Lupinus albus		
	Growth in millimetres	Average not counting millimetres*	Remarks
1/30 grain	12 – 14 13 – 16	14	Normal.
1/20 grain	10 – 17.5 13 – 19	14.9	Normal.
1/15 grain	10 – 18 16 – *	14.6	Normal.
1/12 grain	16 – 17 17 – *	16.7	Normal.
1/10 grain	13 – 15 13 – *	13.7	Normal.
1/5 grain	10 – 12 11 – 16	12.25	Normal.
2/5 grain	9.5 – 12 11 – 16	12.1	Normal.
3/5 grain	12 – 13 13 – 14	13.	One crooked.
4/5 grain	10 – 11.5 11 – 13	11.3	One crooked.
1 grain	7 – 8.5 7.5 – 9.5	8.1	Normal.
1 1/5 grain	3 – 6 5 – 7	5.25	Normal.
1 2/5 grain	2 – 3 2 – 5	3.	Brown.
1 3/5 grain	1 – 0.5 1 – 0.5	0.75	Brown.
1 4/5 grain	0 – 0 0 – 0	0–toxic	Dead and flabby.
2 grains	–1 – –1 –1 – –0.5	–0.9	Shrunk.

*Shows that for some unknown reason that plant had died.

Tincture digitalis, U. S. P., freed from fat (Wyeth): 6 Cc. of this solution was toxic.

Tincture digitalis (Lilly) (physiologically tested): 7 Cc. of this solution were toxic.

A preparation of digitalis "unknown" to me was set aside for me to tell which it was. By making dilutions and comparisons with the other tables of digitalis this preparation was determined as the fat-free tincture; this was correct. Six cubic centimetres were toxic in twenty-four hours.

A solution of strychnine sulphate of a strength unknown to me was made up. When tables of measurements were made and compared with the standard tables, the determination that the solution contained 23½ grains was made. The solution actually contained 24 grains of strychnine sulphate.

In the case of physiologically tested fluidextract of ergot, 5 Cc. in 50 Cc. of distilled water were toxic in 24 hours. Two dilutions of this fluidextract, differing in strength by 6 per cent., were made. I was to determine which was the stronger preparation. After experimentation and calculation I determined the two dilutions as being of 91 and 95 per cent. respectively, and was right concerning which was the stronger. The preparations were actually 88 and 94 per cent. respectively. This shows that the greatest variation from the actual strength was 5 per cent.

Squibb's fluidextract of ergot (about six months old) corresponded to the 95 per cent. dilution.

Another fluidextract of ergot of unknown make, but known to be a low-priced preparation, was tried and was about 77 per cent. in strength when compared with the physiologically tested preparation used as a standard.

Conclusion.—While a student can not expect to demonstrate with his spare time in one year the entire value of this subject and the correctness with which the toxicity or therapeutic activity of certain drugs can be determined, nevertheless these experiments show that there is a certain degree of reliance in this method. The method is a very cheap one, as little and inexpensive apparatus is needed, and all of these experiments were performed with about forty cents' worth of the seeds of *Lupinus albus*. If the active ingredients of a drug deteriorate or change into less active or inert substances, this deterioration would certainly be detected by the difference in effect upon the plant in experiments performed from time to time. The method is one which any person of ordinary intelligence could use after a little experience in the work. Calculations for percentage strength are direct and easy and correct to within from one to ten per cent.

SOME RELATIONS OF PLANTS TO DISTILLED WATER AND CERTAIN DILUTE TOXIC SOLUTIONS.*

By M. C. Merrill.

(Continued from p. 555, December, 1915.)

In addition to the investigations already cited which deal with the practical applications of conductivity work, there might well be mentioned in this connection the work done by investigators in the Bureau of Soils of the U. S. Department of Agriculture: Whitney, Gardner, and Briggs ('97); Whitney and Briggs ('97); Whitney and Means ('97); and Gardner ('98). Heald ('02) used the Kohlrausch method for determining the conductivity of plant juices in order to get indications regarding the dissolved mineral substances in different parts of the plants under experimentation. Nicolosi-Roncati ('07), Bouyoucos ('12), Dixon and Atkins ('13, '13a) and others have also carried on conductivity determinations with different plants and under various conditions.

Sjöqvist ('95) was the first to use the conductivity method in enzyme investigations, which he did in his work on the action of pepsin on protein solutions. Similar work was done by Oker-Blom ('02), who also extended the applications of this method. Oker-Blom ('12) has recently given an account of his own and previous investigations in the field of bacteriology, wherein the electrical conductivity method was used. Various other investigators have also made use of it, among whom may be mentioned Bayliss ('07). Stiles and Jörgensen ('14) give a partial review of some of the historical aspects of this subject as it pertains to plant work.

For the conductivity work herein reported the following apparatus was used:

Wheatstone bridge (Central Scientific Co., catalogue number, 2475);

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* Reprinted from *Annals of the Missouri Botanical Garden*, vol. 2, No. 3, pp. 459-498.

Resistance box, 11,110 ohms (Central Scientific Co., catalogue number, 2444);

Induction coil (Eimer and Amend, catalogue number, 4100);

Dry battery cells (Eimer and Amend, catalogue number, 592);

Conductivity cell, Freas (Eimer and Amend, catalogue number, 5202);

Telephone receiver (Central Scientific Co., catalogue number, 2355);

Thermometer graduated to 1/10° C.;

Water tank holding 50 gallons, specially constructed for the purpose, pilot flame underneath; temperature regulated to 1/10° C.; Tiffany laboratory motor with which to operate a stirring apparatus in the tank.

In the method employed for the work the procedure given below was consistently followed: the tumblers were always filled to approximately the 250 Cc. level with either the solution or redistilled water, depending on the culture. Before taking readings, doubly distilled water was added to bring the water or solution up to the original level, if the transpiration loss since the previous reading made the addition necessary. This was of course essential in order to keep the concentration factor under control. Readings in all cases were taken at 25° C. The control of temperature exactly to within 1/10° C. was comparatively easy by the use of the pilot flame underneath and the stirring apparatus in the tank of water.

For absolutely accurate and final quantitative determinations or ultimate values, as were required, for example, in the case of the standardization measurements for the cell constant with N/50 KCl, or the determination of the specific conductivity of the doubly distilled water, the greatest precautions possible were taken in regard to the conductivity cell and the concentration of its contents. But in making hundreds and even thousands of determinations, most of them as rapidly as accuracy permitted, due to the time factor involved, it was both impossible and unnecessary to dry the cell after each reading, since relative, and not absolute values were desired for the most part. The method employed, therefore, was to remove from the carefully stirred solution in the tumbler a 25 Cc. sample with a pipette of the same capacity, the latter having previously been rinsed with the solution. Using exactly the same amount for each determination further reduced any possibility of error due to unequal dilution in the conductivity cell. Between readings the pipette was kept almost entirely immersed in redistilled water in a tall cylinder attached to a stand in the water bath. After carefully pouring the sample back into the tumbler, in case further readings were to be taken, the cell was rinsed twice with doubly distilled water and rapidly drained before taking the next reading, whether of the same or of a different culture. Any minute amount of doubly distilled water that might be present to dilute the next sample was a constant factor throughout all the readings and was of course inconsequential.

In using fresh batteries it was necessary to insert resistance coils between the battery and the induction coil in order to reduce the current. For this purpose German silver wire was used. While polarization phenomena may possibly be operative to a certain extent, such would be so small as to be practically negligible, especially in view of the fact that the effects from such a cause would be entirely relative and would therefore not affect the validity of the results.

Some of the conductivity results given in this paper are shown in tabular form and others are plotted as curves. In some instances the data are calculated as specific conductivity; in other cases the conductivity is represented by the value of x on the Wheatstone bridge. To make it clear what x actually represents, when the apparatus is set up as it was for the determinations, the following proportion is given:

$$R : R' :: x : 100 - x$$

R is the resistance in ohms inserted in the resistance box; R′ is the resistance in ohms of the solution; and x is the number on the bridge wire (graduated in millimeters from 0 to 100 centimeters). As the position of x on the bridge varies with R and R′, the R for each series of curves or tables will be given (though in the great majority of cases it was 9,110), from which R′ can then be calculated. Having these values, the specific conductivity can be calculated for any determined cell constant (the value of the cell used being .4088). For a fuller discussion see Findlay ('10).

IV. RECOVERY OF PLANTS AFTER BEING IN DISTILLED WATER FOR VARYING PERIODS.

The first question studied pertained to the recovery of plants in full nutrient solution after being kept in doubly distilled water for varying periods. To determine the comparative condition for optimum recovery, the distilled water and the full nutrient medium were renewed every four days in some cultures and left unrenewed in others, in such a way that for either condition of the medium of each set in a certain period the other medium would be both renewed and unrenewed so as to give all possible methods of combination. Examination of Table I will make this clear. Thus, for example, with cultures 11, 12, 13, and 14 of the 10-day period in distilled water the doubly distilled water in Nos. 11 and 12 was unrenewed; but when these cultures were placed in full nutrient solution this medium was unchanged or unrenewed for No. 11 and was renewed for No. 12. The distilled water in Nos. 13 and 14 was renewed, and the full nutrient solution unrenewed and renewed, respectively.

In series 1 the small variety of horse beans (*Vicia faba*) was employed, 8 plants being used to a culture. The condition of the media and duration of growth, the green weight of tops, and the dry weight of tops and roots of series 1 are given in Table I. On ex-

TABLE I (Series 1).

Effect of Renewed vs. Unrenewed Media on Growth of Horse Beans.

Culture no.	Length of period in dist. H_2O days	Dist. H_2O renewed or unrenewed	Length of period in full nutr. days	Full nutr. renewed or unrenewed	Green wt. of tops gms.	Dry wt. of tops gms.	Dry wt. of roots gms.
1	45	Unrenewed	..	....	2.15	.777	.124
2	45	Unrenewed	..	....	1.75	.666	.096
3	45	Renewed	..	....	4.40	.887	.272
4	45	Renewed	..	....	4.40	.870	.235
5	1	Unrenewed	44	Unrenewed	16.30	2.069	.485
6	1	Unrenewed	44	Renewed	27.00	3.069	.707
7	2	Unrenewed	43	Unrenewed	15.85	1.994	.429
8	2	Unrenewed	43	Renewed	32.51	3.543	.743
9	5	Unrenewed	40	Unrenewed	18.90	2.315	.463
10	5	Unrenewed	40	Renewed	26.25	2.895	.700
11	10	Unrenewed	35	Unrenewed	13.35	1.623	.382
12	10	Unrenewed	35	Renewed	26.35	2.928	.697
13	10	Renewed	35	Unrenewed	14.90	1.887	.463
14	10	Renewed	35	Renewed	22.90	2.376	.548
15	15	Unrenewed	30	Unrenewed	14.00	1.719	.388
16	15	Unrenewed	30	Renewed	18.05	1.880	.457
17	15	Renewed	30	Unrenewed	15.60	1.807	.417
18	15	Renewed	30	Renewed	21.20	2.403	.642
19	20	Unrenewed	25	Unrenewed	12.51	1.447	.300
20	20	Unrenewed	25	Renewed	11.40	1.247	.328
21	20	Renewed	25	Unrenewed	11.40	1.319	.284
22	20	Renewed	25	Renewed	15.50	1.670	.454
23	..	....	45	Unrenewed	14.60	1.975	.419
24	..	....	45	Unrenewed	14.70	2.044	.443
25	..	....	45	Renewed	27.85	2.925	.690
26	..	....	45	Renewed	27.05	3.025	.764

amining this table it is seen that even after the plants had remained for 20 days in distilled water, they recovered on being placed in the full nutrient solution, while those remaining for 10 days in distilled water produced practically as much growth when later placed in the full nutrient solution as did the plants which were in the latter medium during the entire period.

Of course, as would be expected, the cultures wherein the full nutrient solution was renewed every four days gave much better growth than did those in the unrenewed medium, due, no doubt, to an increased amount of available nutrients. But an interesting comparison is manifest in connection with the effect of renewing the distilled water; the greater growth of both tops and roots may be noted in cultures 3 and 4, in which the distilled water was renewed every four days throughout the period, as compared with that of cultures 1 and 2, where the distilled water was not renewed, except, of course, for the occasional addition of water to replace the transpiration loss, which, however, was small. Furthermore, in noting the growth of cultures 11–22, inclusive, it is seen that in four of the six cases of comparison between the renewed and unrenewed distilled water, better growth of both tops and roots resulted where the distilled water was renewed. Considering cultures 1–4 and 11–22, inclusive, the total green weight of tops for the unrenewed distilled water as compared with the renewed distilled water, and the same conditions for the dry weight of tops and roots, gave the results to be seen in Table II. The total weight in all cases is therefore greater in the cultures in which the distilled water was renewed.

TABLE II (Series 1).

Effect of Renewed vs. Unrenewed Distilled Water on Growth of Horse Beans.
(Summarized Results of Part of Table I.)

Medium	Green weight of tops in grams	Dry weight of tops in grams	Dry weight of roots in grams
Water renewed	110.30	13.219	3.315
Water unrenewed...	99.56	12.287	2.772

These results therefore indicate that the so-called injury to plants in distilled water cannot be entirely or even satisfactorily explained on the basis of extraction of solutes from the plant tissues. If that were the case we should have the greatest injury and least recovery in those cultures in which the distilled water was renewed, the periodically renewed water effecting *in toto* a greater exosmosis of the salts than the water which is not renewed. This statement will receive verification under the section on conductivity measurements. It would therefore seem that we must seek other explanations for the phenomena observed when plants are placed in distilled water. This phase of the subject will also be discussed later.

The points noted will be clear from an examination of pl. 13 figs. 1 and 2. Plate * 13 fig. 1 shows the various stages of recovery after varying periods in the distilled water. The better growth is to be noted of both tops and roots of No. 2, in which the distilled water was renewed, as contrasted with No. 1, in which it was not renewed. It is interesting to observe how plants, even after 20 days in distilled water, will recover in full nutrient solution and then give even better growth than plants in unrenewed full nutrient solution the entire period, and that after 10 days in distilled water, plants will recover in renewed full nutrient solution and equal in growth plants grown the entire period in renewed full nutrient solution.

Plate * 13 fig 2 shows first (Nos. 1 and 2) the contrasted effect of renewing and not renewing the full nutrient solution. The remaining 8 cultures of the plate show the effect of renewing and of not renewing both the distilled water and the full nutrient solution. In cultures 3–10 the comparison should, of course, be made between the alternating numbers for the distilled water effect (renewed or not renewed), and between successive numbers for the effect of the renewal or the non-renewal of the full nutrient solution. While the culture represented by No. 7 of the plate gave greater growth than did No. 9, that excess was probably due to the individual hardihood of two plants. It is seen that a much more uniform and desirable growth was made by the plants of No. 9.

An interesting point in connection with the horse beans is that 16 days after setting up the series the tips of those plants still in distilled water were more or less blackened, probably as a result of enzyme (oxydase) action, and many of them were considerably inrolled. Such conditions were entirely absent from the cultures in full nutrient solution at that time. When the affected plants were later placed in full nutrient solution there was a gradual recovery from the blackening of the leaves, and this recovery was greater in the case of those cultures in which the distilled water had been renewed than in those in which it had not been renewed. Twenty days later Nos. 3 and 4 were in very much better condition than Nos. 1 and 2. There was much less blackening, some leaves not being blackened at all. The general height of the plants in Nos. 1 and 2 was 1½–2½ inches; and in Nos. 3 and 4 it was 2½–4 inches. A very noticeable feature at the end of the experiment was the condition of the medium, that of Nos. 3 and 4 being of course clear while that of Nos. 1 and 2 was milky, turbid, and opaque, indicating abundant fungous and bacterial action, a condition further emphasized by the hyphal threads and gelatinous coating on the roots.

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* See illustrations in the original article.

The roots of the plants in Nos. 3 and 4 were also in much better condition at the end of the experiment than were those of Nos. 1 and 2, especially as regards length and the amount of lateral root development. The root growth in No. 13 at the end of the experiment was also greater than that in No. 11; but in Nos. 12 and 14 it was about equal. The plants of No. 17 also showed greater root growth than did those of No. 15, and this difference was more marked than in the case of the tops. The lateral roots in No. 17 were produced all along the main roots, while in No. 15 they were practically confined to the upper or older portion of the main roots. Another interesting difference observed was that in No. 17 the main root tips were not permanently injured in the distilled water and when placed in the full nutrient solution they continued growth. This was not the case in No. 15. In general there was not much difference between the roots in Nos. 16 and 18; the plants in No. 18, however, had slightly greater growth of roots and showed less injury and some continuation of growth of the tips, whereas those in No. 16 did not. The same condition of the roots above noted for Nos. 15 and 17 held also in Nos. 19 and 21, respectively; but the difference in favor of the renewal of the distilled water though less marked was nevertheless evident. Likewise, Nos. 18 and 20 were similar to Nos. 16 and 18, respectively.

Strong evidence was therefore afforded by the cultures of horse beans that renewing the distilled water has a favorable effect upon the plants.

Series 2 is in every respect a duplicate of series 1 except that Canada field peas (*Pisum sativum*) were used instead of horse beans (*Vicia faba*), and that the dry weight of the tops was not determined; furthermore, the length of the experimental period was different. The condition of the media and duration of growth, the green weight of tops, and the dry weight of roots are given in

Table III, seven plants being grown in each culture. An examination of this table reveals results similar in many cases to those contained in Table I; plants recovered even after 20 days in distilled water, but after 10 days in this medium the recovery was not so complete as in the case of the horse beans, for the plants so treated did not equal in growth similar ones which had remained in full nutrient solution the entire period. However, plants which had been in distilled water only 5 days before being transferred to full nutrient solution subsequently equalled in growth other plants which had been in the latter medium from the start. The period between 5 and 10 days in distilled water is therefore a critical one, and will be discussed later in other connections.

TABLE III (Series 2).

Effect of Renewed vs. Unrenewed Media on Growth of Peas.

Culture number	Length of period in dist. H_2O days	Distilled H_2O renewed or unrenewed	Length of period in full nutr. days	Full nutrient renewed or unrenewed	Green weight of tops grams	Dry weight of roots grams
1	47	Unrenewed	..	....	.80	.073
2	47	Unrenewed	..	....	.60	.076
3	47	Renewed	..	....	.45	.067
4	47	Renewed	..	....	1.30	.091
5	1	Unrenewed	32	Unrenewed	6.75	.400
6	1	Unrenewed	32	Renewed	11.05	.500
7	2	Unrenewed	31	Unrenewed	5.50	.401
8	2	Unrenewed	31	Renewed	12.90	.568
9	5	Unrenewed	28	Unrenewed	5.95	.263
10	5	Unrenewed	28	Renewed	12.35	.467
11	10	Unrenewed	23	Unrenewed	5.35	.254
12	10	Unrenewed	23	Renewed	7.90	.321
13	10	Renewed	23	Unrenewed	3.80	.160
14	10	Renewed	23	Renewed	6.07	.202
15	15	Unrenewed	18	Unrenewed	3.30	.144
16	15	Unrenewed	18	Renewed	4.40	.175
17	15	Renewed	18	Unrenewed	4.30	.162
18	15	Renewed	18	Renewed	4.15	.169
19	20	Unrenewed	13	Unrenewed	3.21	.124
20	20	Unrenewed	13	Renewed	2.52	.092
21	20	Renewed	13	Unrenewed	4.05	.139
22	20	Renewed	13	Renewed	4.43	.141
23	..	....	33	Unrenewed	5.50	.368
24	..	....	33	Unrenewed	6.94	.420
25	..	....	33	Renewed	9.60	.536
26	..	....	33	Renewed	13.45	.611

Renewing the full nutrient solution again showed beneficial results, as might be expected. But the renewal of the distilled water did not produce such striking results in some respects as in the case of the horse beans; in other ways, however, the results were equally or even more striking. Where the plants remained in distilled water for 47 days the growth was better in one case and poorer in the other where the distilled water was renewed than where it was not renewed. The average growth, however, of the two cultures in the renewed medium was better than that of the two in the unrenewed distilled water.

In Nos. 11–22, there was better growth of tops and roots in four cases where the distilled water was renewed and better growth in four cases where it was not renewed. Considering cultures 1–4 and 11–22 the results given in Table IV were obtained, from which it is again evident that renewing the distilled water exercises no injurious influence, and the conclusion is reinforced that an exosmosis of mineral nutrients is not the fundamental basis of the injury which plants suffer in distilled water. Furthermore, the difference between the renewed and the unrenewed distilled water cultures was very marked if the plants remained for 20 days in distilled water before being changed to the full nutrient solution, the difference being greatly in favor of the cultures in which the medium was renewed.

Table IV (Series 2).

Effect of Renewed vs. Unrenewed Distilled Water on Growth of Peas.

(Summarized Results of Part of Table III.)

Medium	Green weight of tops in grams	Dry weight of roots in grams
Distilled water renewed....	28.55	1.131
Distilled water unrenewed .	28.08	1.259

Figures 1 and 2 of pl. 14 illustrate the points above mentioned. In pl. 14 fig. 2 should be noted the better growth of Nos. 9 and 10—which were in renewed distilled water for 20 days before transfer to full nutrient solution—as compared with Nos. 7 and 8, which had remained in unrenewed distilled water for the same length of time before transfer. The excess of growth in No. 4 over that in No. 6 is probably to be accounted for on the ground that since those cultures were in distilled water but 10 days neither the renewal nor the unrenewal of the medium exercised much effect. Hence the greater growth of No. 4 represents an individual variation.

At the expiration of the experimental period the following conditions prevailed in series 2: while the top growth in cultures 1–4 was about the same in each case, the root growth in Nos. 3 and 4 was much better than that in Nos. 1 and 2, the roots of the former being whiter, cleaner, and having longer and more numerous lateral roots. In the case of those cultures grown in distilled water 10 days before removal to full nutrient solution, Nos. 11 and 12 were in somewhat better condition than Nos. 13 and 14, a difference which might readily be expected for the shorter periods in distilled water due to individual variation. After 15 days in distilled water and 18 days in full nutrient solution the benefits derived from renewing the former were markedly evident in the appearance of cultures 15–18, even though the actual weights did not show such difference. Nos. 17 and 18 were in better condition than Nos. 15 and 16, respectively, especially as regards the root growth; similarly, Nos. 21 and 22 were in better condition than Nos. 19 and 20, respectively.

Some special conditions which are of particular interest were observed when the cultures were examined carefully at the close of the experiment. The first point pertains to the method of recovery. After being in the distilled water only one or two days the top growth of such cultures when placed in full nutrient solution proceeds unhindered from the tips of the main stems, *i.e.*, the tips of the stems remain uninjured and resume growth. But 5 days in distilled water almost marks the limit at which growth can be resumed at the tip of the main axis of the stem when such cultures are subsequently placed in full nutrient solution. After 10 days in distilled water the tips of the stems become injured so that the later growth in full nutrient solution is made from new lateral branches. Hence the period from 5 to 10 days in distilled water before removal to full nutrient solution may be considered a crucial period as regards the recovery and growth of the main stems.

Another point of interest is the delayed maturity which results in the case of the cultures which are grown for some time in distilled water and later are placed in full nutrient solution. Such plants remain in a green and growing condition much longer than do those which have been in full nutrient solution for the entire period, or those which remained in distilled water for a shorter period before being transferred to the full nutrient solution. The growing season of the former is thus prolonged and the date of maturity delayed.

The foregoing series having given evidence of the recovery of plants in full nutrient solution after being in distilled water for 20 days, the question arose as to the maximum length of time plants might remain in distilled water without preventing recovery when subsequently transferred to full nutrient solution. Series 3 was therefore set up. This consisted of cultures of Canada field peas grown in distilled water for 10-, 20-, 30-, 40-, and 50-day periods before transfer to the full nutrient medium. The condition of the media and duration in each and also the results of the series (as shown by the green weight of tops) are given in Table V, Nos. 1–20, inclusive. Renewals in this series also were made every four days. Nos. 21–28 under different conditions and concentration of nutrient solution are given for purposes of comparison. The maximum time limit in distilled water above referred to is thus seen to be approximately 30 days, and this was practically attained only in case of the cultures in renewed distilled water.

TABLE V (Series 3)

Growth of Peas in Renewed and Unrenewed Media for Various Periods up to the Maximum Time for Survival. Also Effect of Adding Water at Different Intervals to Media Under Various Conditions.

Culture number	Length of period in distilled H_2O days	Distilled H_2O renewed or unrenewed	Length of period in full nutrient days	Full nutrient renewed or unrenewed	Green wt. of tops grams
1	10	Unrenewed	42	Unrenewed	4.50
2	10	Unrenewed	42	Renewed	8.00
3	10	Renewed	42	Unrenewed	4.85
4	10	Renewed	42	Renewed	6.30
5	20	Unrenewed	32	Unrenewed	2.70
6	20	Unrenewed	32	Renewed	5.05
7	20	Renewed	32	Unrenewed	3.55
8	20	Renewed	32	Renewed	1.40
9	30	Unrenewed	22	Unrenewed	.55
10	30	Unrenewed	22	Renewed	1.30
11	30	Renewed	22	Unrenewed	1.90
12	30	Renewed	22	Renewed	1.90
13	40	Unrenewed	12	Unrenewed	.50
14	40	Unrenewed	12	Renewed	.55
15	40	Renewed	12	Unrenewed	.65
16	40	Renewed	12	Renewed	.72
17	52	Unrenewed	..	....	.60
18	52	Unrenewed	..	....	.45
19	52	Renewed	..	....	.56
20	52	Renewed	..	....	.55
21	Unrenewed full nutr. 42 days, dist. H_2O added every 8 days				6.40
22	Unrenewed full nutr. 42 days, dist. H_2O added every 4 days				6.00
23	Renewed full nutr. 42 days, the sol'n renewed every 8 days				8.75
24	Renewed full nutr. 42 days, the sol'n renewed every 4 days				18.50
25	Unrenewed 1/10 full nutr. 42 days, dist. H_2O added every 4 days				2.90
26	Unrenewed 1/5 full nutr. 42 days, dist. H_2O added every 8 days				2.95
27	Renewed 1/10 full nutr. 42 days, sol'n renewed every 4 days				10.10
28	Renewed 1/5 full nutr. 42 days, sol'n renewed every 8 days				7.85

(*To be continued.*)

HENRY T. HELMBOLD, "THE BUCHU KING." *

On a part of the first floor of the Continental Hotel, with a Chestnut Street front by the side of the main entrance, there used to be, in the days when the hotel was the foremost rendezvous in Philadelphia for both national and local men of distinction—or what the Fifth Avenue then was to New York and the Palmer House to Chicago—a flashing, brilliant drug store, full of color and light and mirrors and prismatic glasses, and in front of it a crystal-like pestle with the name "Helmbold's" in letters which seemed to allure the public eye. In the '70s, and indeed long before that time, through the advertising columns of the newspapers there was perhaps no other name more known to everybody in the city in connection with boldly eccentric and sometimes fantastic exploitation. Of all the advertisers of patent medicines who have compounded fortunes, in short order, out of insistent methods of projecting their names and their vocations continually before the public eye, there has probably been none who was quite so much an object of bewildered wonderment and amazement to not only quiet and conventional people in Philadelphia, but sometimes to the liveliest men of the world, as Henry T. Helmbold, or Doctor Helmbold, as he always called himself, with as much impressiveness as if he were a Virchow or a Pasteur. One medicine in particular which he proclaimed everywhere with as much of a triumphant stir as if he were the greatest benefactor of humanity was called Buchu; multitudes of people were persuaded that it was the chief medical "discovery" of the nineteenth century, and it was one of the favorite devices of Helmbold to have himself heralded in the advertising columns of the press as the "Buchu King."

Nor was there any other man in Philadelphia whom city editors and reporters were more likely to watch or inquire after as a source of news than this luxurious son of audacity and ostentation. At times he seemed to be so wild in his eagerness to claim attention that it was difficult to determine whether he was simply exaggerating the methods of Barnum or whether his wits were diseased. On

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* The above article, written by "Penn" in the *Philadelphia Evening Bulletin* of July 21, 1915, is deserving of a place in the history of proprietary medicines. The career of Helmbold well illustrates what was possible at a time when the practice of medicine was probably at its lowest ebb in the United States.—EDITOR.

Chestnut Street, on Broad Street, in Fairmount Park, there were no horses and carriages like his; his person sparkled with diamonds, and his dinners were talked of in language which might have befitted the feasts of Lucullus. He was constantly in the habit of causing reports to be circulated concerning his intimacy with statesmen and foreign potentates, his elaborate plans for the construction of palatial mansions, his munificence as a patron of art, and the sensational joys of his European travels. But after all allowance was made for his boasting and for his tricks as a charlatan in the allurements of publicity, it had to be acknowledged that he did things with his money such as nobody outside of Kirkbride's or a comic opera would have thought of doing, and that if there was humbug in him as the "Buchu King," there was plenty of reality in him as the King of Sports.

Helmbold's beginnings in Philadelphia had been humble. It used to be said of him that he came from the country when a youth and that he found employment at the Market Street drug store of George W. Carpenter, whose home and grounds in Germantown were one of the suburban "sights." With an extremely buoyant and ambitious temperament and with a boundless faith in himself, he learned enough in the drug house to understand how first-rate profits could be made in the business when it was carried on carefully, and how enormous profits could be made in it when it was carried on boldly. Accordingly he rented a small store in the vicinity of Powers and Weightman's chemical works at Ninth and Brown Streets, began to make what he called "Buchu," described its origin as a mysterious African plant, and sold enough of it to the credulous to enable him to come downtown and fit up a pharmacy and "laboratory" on Chestnut Street, near Tenth. Still a young man, he made up his mind that he would spend on the newspapers all the money that he could spare and that he would thus repeat the tactics of Dr. Jayne in becoming a millionaire. His success went beyond all expectations. He could not prepare the medicine quickly enough to meet the flood of orders that soon began to pour in on him. Instead of half a column, he took a full column and then two columns—this was then a very big advertisement—in each of the principal newspapers. There was no newspaper in Philadelphia which he would not use if it had a thousand readers who, he could be assured, visited the drug stores. Most other advertisers felt that they were pigmies as compared with him. Twenty thousand, fifty thousand, a hundred thousand, finally a quarter of a million dollars a year were believed to be expended by him at a time when probably no merchant or commercial firm expended annually a half of the maximum of these amounts. He declared not only that no man in Philadelphia had gotten rich so rapidly as he had, but that none who had ever done so deserved it so much as he did.

In the course of time he turned his attention to New York also as a field not only for the great Buchu, but for the display of his own opulent and imposing self. When the once-celebrated Metropolitan Hotel which was situated on what is now lower Broadway and to which Niblo's Garden theatre was a notable adjunct, was still in the fulness of its glory, he lavished a fortune on the equipment and decoration of a " pharmacy " in a part of the hotel. His expenditures in the hotel as a dinner host and wine-opener were said to have been greater than those of anybody that had ever entered its doors, " Coal-Oil Johnny " not excepted. He bought one of the finest houses in what was then the Fifth Avenue district, furnished it with the splendor of a palace, and seemed to set up a rivalry to " Jim " Fisk in catching public attention as a " high-flyer." Sometimes, garbed in clothes such as a gentleman of quiet and modest tastes might wear, without color or jewelry, he would drive on the principal streets with a magnificently dressed coachman and a pair of footmen blazing with scarlet coats, and at Long Branch, where President Grant had his " summer capital," Helmbold and his wife, who had the reputation of being a clever as well as a beautiful woman, set up what the wits called " the Court of the Prince of Buchu." Helmbold emphatically declared that his wife was the finest specimen of her sex in America and that in Europe there was no one to be compared to her, unless it was the Empress Eugenie.

It was in Europe that some of Helmbold's adventures caused such a stir that he was burlesqued on the Parisian stage as a typical American of the upstart breed. His banquets and receptions were compared to those of nabobs from Oriental countries, and on one occasion he had the Shah of Persia as his guest in the midst of superb scenes of Persian luxury, the most skilful designers of palatial furnishings in Paris having been instructed to contrive such embellishments as would make the potentate feel that he was, for the moment, in his own Teheran. Meanwhile, in that portion of the boulevard press which lives on the arts of puffery as well as blackmail, Helmbold was praised to the skies as one of the world's self-made men, a savant and philanthropist who would be worthy of a place among America's "Forty Immortals," if there were an Academy on our side of the Atlantic. But about this time there were some signs, in his speech and behavior, which indicated that he was influenced by other motives than cunning and money-making in paying out fortunes for all this display as well as the inordinate eulogies of the press. It began to be whispered that he ought to be regarded by wise people not so much with disgust as with pity. Some of his behavior had been called eccentric, but men who watched him closely shook their heads and said that he was rapidly becoming a victim of vicious exercises and the excitation of disordered nerves. In Philadelphia it had been supposed that his apparent follies had all been planned chiefly with regard to their effects on the business in "Buchu." But however this may have been, the feverish, extravagant and fantastic joys which he found in Paris were altogether too much for him, and at last the suspicion that he had really been out of his mind at times was confirmed by his boisterous exhibitions of rage over the slightest trifles and a frantic attempt to slay his wife. It soon became necessary to put him in a madhouse; his escape from it enabled him to get back to this country, and here the controversies, litigation, commitments and escapes in which he was concerned for a number of years quite equalled in sensational effect and almost exceeded in duration the contests which Harry Thaw has made on the question of his lunacy. All his financial affairs went to pieces, and for a while he was an inmate of the Kirkbride Asylum in West Philadelphia. Subsequently, after having had some partial return of his reason, he died in another hospital utterly crazy.

The famous drug store in the Continental had passed into the control of or possession of his brother Albert, who was also a familiar character among men about town, but who had little or none of the dash and genius of "the doctor" as an advertiser. When the affairs of the Helmbolds were before the courts, all sorts of stories came out concerning the vagaries and escapades of the "Buchu King"—how he contemplated buying the Continental and turning it into a huge laboratory, how he was going to take charge of the Medical School of the University of Pennsylvania over on Ninth Street, how he had formed a plan of leading an expedition into Africa in order to "discover" new plants for medical uses, and how he had intended to raise a great campaign fund for nominating himself as a candidate for President of the United States against Grant. When he was sane, or, at least responsible and at large, he always avowed, with gushing frankness, that to the newspapers was due everything that he was and everything that he had. "No fellow can get along," he would say, "who doesn't advertise; the great thing is never to let the public forget you." It was one of his boasts that for every one Philadelphian who had heard of such able men as Doctor Gross and Doctor Pancoast, there were ten thousand who had heard of "Doctor" Helmbold. In a genial but brazen defiance of what we call the conventionalities and in a vainglorious love of money simply as a means for obtrusion and display, it is doubtful whether there had been before, or has been since, a like Philadelphian on the promenades of Chestnut Street. To sarcasm and to ridicule he was apparently insensible; no one could talk him down or laugh him down, and when he passed along the Continental he was prouder of himself than any peacock could be with a full-spread tail. As it used to be the habit to call "Bob" Fox, of the famous "Varieties," the wickedest man in the city, so it was to call "Doctor" Helmbold the liveliest, and he was probably quite as much in earnest as he seemed to be in jest when he frequently declared that he would become so rich that Chestnut Street would some day be known as Helmbold Avenue!

Nowhere outside of the stage and the madhouse could anyone have found his duplicate.

CORRESPONDENCE.

Whisky and Brandy in the U. S. Pharmacopœia.

The Executive Committee of the National Association of Retail Druggists, in session in Chicago the week of December 6, 1915, unanimously approved the following resolution:

"Whereas, The deletion of whisky and brandy from the United States Pharmacopœia by the committee on revision has not met with the approval of the medical and pharmaceutical professions throughout our country; and

"Whereas, The action of the Federal authorities relative to the standard for whisky can not set aside the decree of Congress in so far as the Pharmacopœia is recognized as a standard for medicinal substances, whatsoever may be its effect upon food standards, and can not apply in intrastate pharmacy where the Pharmacopœia is the legal standard; and

"WHEREAS, We consider that the liquor question should not influence the sound judgment, wisdom, and intelligence of the revision committee of the United States Pharmacopœia; therefore be it

"*Resolved,* That we respectfully and earnestly suggest to the point of insistence that the revision committee reconsider the vote on this most important question, and we strongly desire that there be included in the ninth revision of the United States Pharmacopœia monographs on whisky and brandy containing satisfactory descriptions and tests for the identification of whisky and brandy suitable for medicinal purposes."

In connection with the above resolution letters have been received from the secretaries of the National Association of Retail Druggists and the Minnesota State Pharmaceutical Association, as follows:

DEAR MR. KRAEMER:

The above resolution was authorized and endorsed by the N. A. R. D. Executive Committee at its annual meeting in Chicago the week of December 6, after a full and free discussion of the subject.

The deletion of whisky and brandy from the standardized publication, from our point of view, was a big mistake and calculated to work an immense injury to the retail drug trade of the entire country. This is not to be construed from an economic point of view, but from a broader and moral point. You well know that this deletion would not of itself stop the sale for medicinal purposes, but it would legalize the sale of any substitute mixture, provided it did not contain wood or denatured alcohol or deleterious matter.

Trusting that a reconsideration of the recent vote on this most important subject may be moved in the early future, we are,

Fraternally yours,

T. H. POTTS,
Secretary.

My Dear Professor Kraemer:

I enclose copy of a resolution unanimously approved by the Executive Committee of the National Association of Retail Druggists, in session in Chicago the week of December 6, 1915.

The matter of the deletion of whisky and brandy from the Ninth Revision of the United States Pharmacopœia has been discussed for sometime by pharmacists throughtout the Northwest. The consensus of opinion among pharmacists in this section of the country undoubtedly is that, inasmuch as whisky and brandy are frequently prescribed by physicians to be used for medicinal purposes, suitable standards should be provided for these substances in the Ninth Revision of the Pharmacopœia. The chief reason for deleting whisky and brandy appears to be the questionable value of these substances as remedial agents. The more or less extensive prescribing of whisky and brandy by physicians at the present time not only warrants the continuation of these products in the Pharmacopœia, but demands that they be continued if pharmacists are to serve physicians most satisfactorily.

The writer understands that monographs suitable for whisky and brandy have already been prepared for the U. S. P. IX, and believes that Northwestern pharmacists would vote almost unanimously in favor of having these included in the new Pharmacopœia. I, therefore, request that you, as a member of the revision committee, give due consideration to the enclosed resolution.

Yours sincerely,

E. L. Newcomb,
Secretary.

Minnesota State Pharm. Ass'n, Northwestern Branch, American Pharm. Ass'n.

BOOK REVIEWS.

An Introduction to Bacteriology for Nurses. By Harry W. Carey, A.B., M.D. Philadelphia: F. A. Davis Company, 1915. Price, $1 net.

The number of books on bacteriology are likely to equal those in elementary chemistry. Many of them necessarily contain but little more than the matter in standard works. This great output of bacteriological books is not likely to be criticised at present, as the subject concerns the interest of public health and is deserving of the widest publicity. Dr. Carey's work is among the first books especially adapted for the training of nurses. The author has had a somewhat extended experience in teaching the nurses of the Samaritan Hospital Training School of Troy, N. Y. Furthermore, Dr. Carey is the city bacteriologist in Troy, and therefore well prepared to write a work for the use of nurses. It is an excellent book and one deserving of a wider class of readers. Throughout the book is given instruction to nurses and attendants in the handling of patients who are affected with bacterial diseases. The facts are well stated and the information it contains is both instructive and interesting.

BERICHT VON SCHIMMEL & CO. (Inhaber Ernst, Karl u. Hermann Fritsche) in Miltitz Bez. Leipzig, über Ätherische Öle, Riechstoffe u.s.w., October, 1915.

This semi-annual monograph of Schimmel & Co. gives a *résumé* of the scientific progress and other work connected with essential oils that has been accomplished within the past six months. The text relating to volatile oils in both the British and Finnish Pharmacopœia is critically considered. We anxiously await the appearance of the English translation, so that we can more easily republish some of the matter contained in this *Bericht*. The present numbers are doubly valuable, coming during these strenuous times, and reflect the highest type of patriotism, as the information concerns all users of essential oils.

THE "WELLCOME" PHOTOGRAPHIC EXPOSURE RECORD AND DIARY, 1916. Price, 50 cents net.

Photography continues both to serve and to fascinate, and this little volume stands preëminent as a useful guide to the art in its varied phases. It maintains and has extended its reputation as a concise encyclopædia of photographic information, ranging from simple routine operations to the developments of the higher photography. It forms and advises on everything—on photography by night and the correct quantities of flashlight powder; on green, or sepia, or blue toning of bromides, or warm tones on gaslight papers; on time and factorial development, the intensification of color plates, exposures for interiors, the speeds of bromide papers, the staining of prints, etc. Not one of the varied aspects of the art appears untouched, and, besides all this, there are instructive tables, simple formulæ, and a multitude of useful hints.

Of especial value is the "Wellcome" Exposure Calculator, an ingenious rotary device, fixed to the back cover, which, by one turn of one scale, indicates the correct exposure of any plate or film at any time of day or year. For British, Colonial, American, and Continental plates and films independent exposure factors are given. The illustrations have always been a feature of this publication—not only because they are the work of leading experts, but because they are reproduced with great skill and taste. This year there are included examples of the work of two leading American photographers, Merl La Voy and Robert G. Weyh, Jr.

CURRENT LITERATURE.

Oleoresin of Aspidium.

The Physical and Chemical Properties of the Oleoresin of Aspidium with Respect to the Detection of Adulterations.—The adulteration of the extract is not limited to the addition of foreign substances to the finished product, but begins with the drug from which it is prepared. The forms in which the drug is contaminated may be conveniently classed under three heads: (*a*) the substitution of old, deteriorated rhizomes for the fresh, active drug; (*b*) the admixture of the chaff and dead stipe bases with the rhizomes; and (*c*) the addition of the rhizomes of other species of ferns to those of the official species. The first form of adulteration is, perhaps, the most common and most widely spread.

The present methods of assaying the extract of male fern do not give results which indicate its therapeutic value. It is admitted by Dr. DuMez that the properties of the extract tabulated in his paper can not be used as factors for measuring the degree of activity; they only can serve as a means of distinguishing between an extract recently prepared from fresh, green rhizomes and that prepared from old rhizomes or in detecting a deteriorated or adulterated product. Viewed from this standpoint, the following conclusions can be drawn: The color of the extract, when prepared from rhizomes, is yellowish-green; a brownish shade indicates the use of old rhizomes; deep green means the addition of chlorophyll or other foreign coloring material, such as a salt of copper. The use of old rhizomes receives further confirmation in a low index of refraction (the refractive index is also lowered by the addition of castor oil) and in the dark color of the ethereal solution of the crude filicin obtained in the filicin assay. The presence of a copper salt can best be confirmed by an examination of the ash, applying the usual tests for copper. The addition of chlorophyll is difficult to detect chemically, owing to its presence as a natural constituent of the extract. However, the amount which must be added to obscure the brown color imparted by old rhizomes is so great that it can easily be detected with the naked eye in the original sample and in the solubility tests.

The addition of castor oil to the extract produces a considerable change in all of its properties. It is especially indicated in the low specific gravity, index of refraction, and iodine and saponification values. Its presence can be most easily confirmed by the solubility tests.

The presence of aspidin can be readily determined by Hausmann's method, which serves as a practical means of detecting the use of *Aspidium spinulosum* Sw. in the preparation of the extract.

The use of acetone as directed in the United States Pharmacopœia yields a product which separates in two layers upon standing—an upper oily layer and a lower layer darker in color and thicker in consistency than that above. This in itself serves as a ready means of detecting its use, which is further confirmed by the solubility tests and the high ash content.

The iodine and saponification values vary in the same direction as the filicin content, and, therefore, might be used to displace the rather long and expensive method of the present filicin assay. Especially is this true in the case of the saponification value, which requires but one gramme of the extract and less than an hour to complete. (By A. G. DuMez, *The Philippine Journal of Science,* vol. viii, No. 6, Sec. B, Tropical Medicine, December, 1915.)

J. K. THUM.

FIFTY FALSELY LABELLED MEDICINES.

More than half a hundred legal actions have been terminated successfully under the Sherley Amendment to the Food and Drugs Act, which prohibits false and fraudulent claims as to the curative or therapeutic effects of drugs or medicines. Criminal prosecutions against the manufacturers were brought in 25 cases, but in 31 instances the falsely and fraudulently labelled medicines were seized while in interstate commerce. Claims made by the manufacturers for the curative powers of these preparations ranged from tuberculosis, small-pox, and diphtheria to coughs, colds, and scalp diseases. A number of other criminal prosecutions and seizures are pending in various Federal courts throughout the United States because of alleged violations of the Sherley Amendment similar to those which have already been tried. The officials charged with the enforcement of the Food and Drugs Act are of the opinion that the evils of the patent-medicine business can be stopped only by the most drastic action.

It is pointed out that traffic in medicines for which false and fraudulent claims are made is not only an economic fraud of the worst kind, in that a worthless preparation that costs but a few cents is frequently sold for a dollar or more a bottle, but that health, and even life, is endangered by failure to secure the service of a physician in such serious diseases as tuberculosis, diphtheria, pneumonia, and scarlet fever until too late, because reliance may have been placed in the curative powers of some worthless preparation which is claimed to be a never-failing remedy. The deluded victim may not realize his danger until the disease has reached a stage too far advanced for even the ablest physicians to cope with it. Effective treatment depends in most cases on applying it during the early stages of the disease.

The Houchens Medicine Company of Baltimore, Md., pleaded guilty to the charge that a preparation called " Family Physician " and shipped by them into interstate commerce was falsely and fraudulently labelled. Among the many diseases for which this medicine was recommended by the manufacturers in statements appearing on the labels and accompanying circulars were diphtheria, scarlet fever, typhoid fever, small-pox, bronchitis, neuraglia, croup, and all diseases of the throat and lungs. The following quotations from the label, carton, or circular are interesting: " The public is hereby assured that this is the genuine and original family physician. . . . For fever you need not give anything else but this medicine; it will keep the rash out itself. . . . For cases of small-pox take plenty and often. . . . Use freely. Give no hot teas; just give the medicine, and what pimples are under the skin will come out, the rest will be carried off by the medicine. . . . Also a wonderful and positive remedy for dyspepsia, keeps measles out nicely, regulates the bowels without trouble, and by purifying the blood prevents your liability to disease."

Analysis of the product, which was claimed by the manufacturer to be effective in the treatment of so many virulent and contagious diseases, as well as a variety of minor ills, showed that it was a syrup containing 19.2 per cent. non-volatile matter, 8.9 per cent. alcohol, anise, and a vegetable cathartic drug. The Government, therefore, charged that the medicine did not contain ingredients or medicinal agents effective for the relief and cure of the diseases which it was claimed to cure. The court imposed a fine of $75.

A plea of guilty was entered by H. A. Ingham & Co. of Vergennes, Vt., to the charge that statements and claims as to curative powers of a product called " Dr. H. A. Ingham's Vegetable Expectorant Nervine Pain Extractor " were false and fraudulent. An analysis of a sample of the product by the Bureau of Chemistry showed the same to contain alcohol, 86 per cent.; opium alkaloids, camphor, capsicum, and vegetable extractive matter. The Government, therefore, alleged that the medicine did not contain ingredients or medicinal agents effective, as the labels or circulars asserted, to subdue raging fever, or to cure typhoid fever, lung fever, scarlet fever, rheumatic fever, cholera, dysentery, sunstroke, diphtheria, bleeding at the lungs, nervous exhaustion, or piles, or to prevent fits of apoplexy and epilepsy when coming on, or to heal without inflammation or suffering all wounds, sprains, or burns, or to break up a felon, or to cure congestion of the lungs, pleurisy, fits of apoplexy, chronic rheumatism, paralyzed limbs, and croup.

It was also alleged by the Government that the statements, " For teething and restless children, it is not only safe and harmless, but positively beneficial; it agrees with the most tender child or feeble infant," were false and misleading in that they were of such nature as to mislead the purchasers into the belief that the article contained no harmful or poisonous ingredient, whereas, in fact, it did contain morphine and other opium alkaloids of a poisonous and deleterious nature, such as might prove harmful and deleterious to the health of tender children and feeble infants, and other persons, if consumed by them. The court fined the defendant $100.

Four thousand and ninety-two bottles of " Father John's Medicine " were seized in Philadelphia, Pa., it being alleged in the libel that the labels on the bottles and on the pasteboard packages containing the bottles bore statements regarding the curative effects of the medicine that were false and fraudulent. Claims were made by the manufacturers for the efficacy of the medicine in the treatment of consumption, coughs, colds, croup, asthma, bronchitis, sore throat, whooping-cough, pneumonia, catarrh, rickets, and a number of other ailments. A judgment of condemnation and forfeiture was entered, and it was ordered by the court that the product be delivered to Carleton and Hovey Company, Lowell, Mass., upon payment of all the costs in the proceedings and the execution of a bond in the sum of $5000, to insure that the goods would not be sold unless truthfully relabelled.

A verdict of " guilty " was rendered against the American Laboratories, a corporation located at Philadelphia, Pa., for shipping into interstate commerce a product called " Bad-Em-Salz," which it was alleged was falsely and fraudulently labelled. An analysis of a sample of the product showed that it consisted of common salt, Glauber salt, baking soda, and a small amount of tartaric acid. It was claimed by the manufacturers that this preparation reproduced the medicinal properties of the great European springs famous for centuries for the cure of diseases of the stomach, intestines, liver, kidneys, or bladder, and that it represented the medicinal agents obtained by the evaporating of the water from famous European springs. The Government alleged, among other things, that these claims were false and misleading. It was also alleged that the statements in the circular indicating that the preparation contained ingredients or medicinal agents effective for dissolving gall-stones, for the prevention of gastritis, for curing diabetes, for preventing or checking chronic inflammation of the kidneys, and for relieving catarrh of the bladder, were false and fraudulent. A fine of $100 was imposed by the court.

Long List of Other Misbranded Medicines.

The following list includes other preparations against which the Government's charge that they were falsely or fraudulently labelled was sustained by the Federal courts. Statements were made on the labels of, or on the circulars accompanying, the preparations intended to make the purchaser believe that the medicines were effective cures for a great variety of diseases for which they were recommended by the manufacturers or promoters. The main allegations of the Government were upheld by the courts and judgment accordingly entered in connection with each of the following preparations: Radam's Microbe Killer, Hilton's Specific, Smith's Agricultural Liniment, Dr. Sullivan's Sure Solvent, Russell's White Drops, Stramoline, Wild Cherry Pepsin, Moreau's Wine of Anise, Dr. Herman Koch's Brand Phosphate, Celery and Gin Compound, Swissco Hair and Scalp Remedy, Cod Liver Oil with Syrup of Tar, Dr. Mozley's Lemon Elixir, Sa-Yo Mint Jujubes, Gray's Glycerine Tonic Compound, Dr. Martel's Female Pills, Quickstep, Frye's Remedy, Seawright's Magnesian Lithia Water, Hill's Aromatic Extract Cod Liver Oil (Hollander-Koshland Co.), Black's Pulmonic Syrup, Tetterine, Laxative Quinine Tablets, Mrs. Joe Person's Remedy, Maignen Antiseptic Powder, Cranitonic Scalp Food-Hair Food, Dr. David Kennedy's Cal-Cura Solvent, Schenck's Pulmonic Syrup, Keller's Flaxseedine, Tutt's Pills, Universal Rheumatic Remedy, Green Mountain Oil, Weber's Genuine Alpine Herb Tea, Montague's Liniment, Coe's Cough Balsam, White Stone Lithia Water, Kalamazoo Celery and Sarsaparilla Compound, Quality Damiana Compound, Dennis Eucalyptus Ointment, Cassidy's 4X, The Great Blood Purifier, Porter's Antiseptic Healing Oil, Ballard's Horehound Syrup Comp., Dr. Shoop's Night Cure, Dr. Shoop's Cough Remedy, Dr. Shoop's Restorative, Rheumacide, Rice's Mothers' Joy Salve, Milam, Old Jim Fields' Phosphate Dill and Gin, Stuart's Buchu and Juniper Compound, Ozomulsion, Jones' Break Up, Carswell's Liver Aid, Dr. Shoop's Twenty-Minute Croup Remedy, Rogers' Consumption Cure and Cough Lozenges, and Rogers' Inhalant.

"Kidney Cures" Seized.

Action against several so-called "kidney cures" has recently been taken under the Food and Drugs Act by the United States Department of Agriculture. In one case the shippers of a preparation labelled as "A Sure Cure for Bladder and Kidney Trouble" were prosecuted on the charge of falsely and fraudulently misbranding the product. They pleaded guilty and were fined $25 and costs by the court. This particular kidney "cure" was found to contain over 41 per cent. of alcohol. It was labelled "Old Jim Fields' Phosphate Dill and Gin—Mankind's Greatest Friend—A Sure Cure for Bladder and Kidney Trouble: It is also a Great Aid in Case of Urinary Trouble. Allenberg & Meister, Sole Agents, Memphis, Tenn." An analysis of the product showed that it contained no material amount of either dill or phosphate.

In another case 48 bottles of "Stuart's Buchu and Juniper Compound," prepared by the Stuart Manufacturing Company, Atlanta, Ga., were seized. The court issued a decree of condemnation, forfeiture, and destruction on the ground that the claims upon the label were misleading, false, and fraudulent. On this label the manufacturers recommended their product as a remedy for a great variety of kidney and bladder diseases, and stated that the medicine contained 16 per cent. of alcohol.

According to the medical experts of the department, alcohol is a kidney irritant and is dangerous in many cases of kidney disease. For this reason many physicians advise their patients who suffer from any kind of kidney or bladder trouble to abstain from the use of alcohol, even in moderate quantities. Some manufacturers of kidney medicines which contain considerable quantities of alcohol also advise their customers to abstain from all alcoholic drinks, showing in this way that they know the harmfulness of alcohol in kidney diseases, even though they use it in their own preparations. It is the opinion of the medical experts of the department that such so-called "kidney remedies" as those recently seized are not only worthless but actually harmful, because of the amount of alcohol which they contain.

THE CULTIVATION OF MEDICINAL PLANTS.

Peppermint and Spearmint as Commercial Crops.

The annual production of peppermint and spearmint oil in the United States is estimated by the Department of Agriculture at about 250,000 pounds out of a total production throughout the world of about 600,000 pounds. Practically all of this oil is produced in Michigan, Indiana, and New York, a little less than 25,000 acres being planted to mint in these States. It is said, however, that there are other localities in which the industry could be profitably developed if there were a greater commercial demand for the oil. At the present time, however, the price of peppermint and spearmint fluctuates widely, and the entire industry would be likely to suffer from overproduction if the acreage were to be rapidly extended.

On the muck lands of southern Michigan and northern Indiana, where mint culture has become highly specialized, the cost of establishing an acre of new mint and caring for it during the first season is placed at about $30. In subsequent years the cost per acre would be about $15. These estimates do not make any allowance for fertilizers, taxes, interest on the land, equipment, superintendence, and other overhead charges of this character. In Wayne County, New York, where mint is cultivated on uplands, the cost of preparing the land is somewhat less, but the tillage costs, on the other hand, are higher because of the greater quantity of hand labor required. The industry in the New York district, however, appears to be declining in extent. It is now carried on in rather a small way, chiefly by coöperation between land owners and practical mint growers. In Michigan and Indiana, on the other hand, many of the growers have invested considerable capital in the business and have provided themselves with an equipment which enables them to handle the product in an economical manner.

The yield of oil per acre varies widely, ranging from almost nothing to nearly 100 pounds. About 325 pounds of peppermint and 340 pounds of spearmint are required to produce a pound of oil in commercial practice. The price varies as widely as the yield. For peppermint oil in tins, however, the average trade price for the last forty years has been in the neighborhood of $2.50 a pound, although it has sometimes fallen as low as 75 cents. Spearmint oil, which used to be a little cheaper than peppermint, has averaged for the past five years $3.55 a pound. These prices, however, it must be remembered, are somewhat higher than those which the producer would receive.

In Michigan and Indiana the large plantations have of late years installed their own distilling plants, many of which are elaborate and expensive. For growers who do not have their own distilling plants, the customary charge for distilling oil has been fixed for many years at 25 cents a pound. The bulk of the mint grown in this country is distilled in comparatively small plants which serve the needs of several growers.

Both peppermint and spearmint thrive best in deep soils which are rich in humus and retentive of moisture but fairly open in texture and well drained. They may also be grown successfully in well-prepared upland soils, such as those suitable for corn or potatoes. The area selected should be summer fallowed for one or two years before the mint is set out, or else it should be cropped with some plant that requires clean and frequent tillage. The tillage is also continued as long as possible during the growth of the crop, for successful mint growing implies clean culture at all stages of progress. The crop is cut at the time of full bloom, which, with new plantings, is usually early in September. It is, as a rule, allowed to dry partially in the field before being hauled to the still. Laboratory experiments show that this results in an appreciable loss of oil, but the loss is not regarded by growers as sufficient to offset the increased cost of handling and distilling the green herb. Exposure to frost, however, must be avoided, as frozen mint yields scarcely one-half of the quantity of oil which could otherwise be secured.

Nitrate of soda, applied at the rate of 50 to 150 pounds to the acre, and potash have been widely used as fertilizers to stimulate the growth of mint, and potash is particularly useful against a form of chlorosis, due, apparently, to too much water in the soil. On the other hand, ground bone, acid phosphate, and lime do not seem to be of marked benefit. Few diseases and pests trouble peppermint, and spearmint is practically free from them all. During very wet seasons a rust fungus sometimes appears, and crickets, grasshoppers, and caterpillars may always do some damage. On suitable soil and with proper cultivation, yields of from two to three tons of mint herb per acre may be expected. As has already been said, however, the yield of oil is extremely variable, and large yields can be expected only from fields that are in the best possible condition. A fair average for well-managed commercial plantings may be said to be 30 pounds of oil per acre. Since the oil is the chief marketable product, adequate distilling facilities and a market for the oil are essential to success in the industry, and the prospective mint grower should assure himself on these points before investing capital in plantations.

PROGRESS IN APPLIED SCIENCE.

Oysters vs. Smelters.

An interesting case was fought out in the United States District Court at Norfolk, Va., and a decision given by the jury on Saturday, June 27, 1914. Mr. Hemingway, a wealthy oyster packer who is retiring from the oyster business, brought suit for $15,000 damage to his oyster beds by the Virginia Smelting Company

Plaintiff produced receipts from the State inspector of grounds leasing him oyster ground near the smelting plant, and showed that the smelting company poured slag on some of his beds. The grounds for the suit were based on damage to oysters by the action of " copper and other deleterious substances " on the oysters.

Plaintiff produced an abundance of evidence from oystermen and others who swore that the smeltery had ruined the oysters for distances as much as fifty miles in all directions. A pamphlet from the State Bureau of Chemistry was put in evidence in support of the view that the smeltery did the damage. A chemist employed in government service was placed upon the stand and testified to the finding of certain percentages of copper in oysters from near the works, and gave his explanation of how the copper came to them from the plant, although he found only " traces " of copper in the slag.

The defence proved that copper in slag was not soluble; that its business is to recover copper and not to scatter it over the country; that enormous amounts of Paris green were spread on the lands in the surrounding districts yearly for a long time; that there were many other sources of copper, and, finally, that *copper is as necessary to the life of the oyster as iron is necessary as a carrier of oxygen in mammals.*

It proved that oysters in Spain, Holland, England, New York, New Jersey, and many other places had copper in quantities greater than was claimed by plaintiff in the oysters near the smeltery. The defence showed that oysters all over the district, as much as fifty miles away and up the river, had more copper than near the smelting plant. The prosecuting attorney claimed that the defendant was proving *that the plant was taking the copper out of the oysters as they got nearer the works.* The defendant solemnly repudiated any such claim, but proved that all the damage was due to sewage, and showed by incontrovertible evidence the oysters from these beds were not allowed to be sold for food and that copper had nothing to do with it, but that it was purely a question of sewage contamination.

During the proceedings both sides got busy opening oysters to prove their respective contentions. The results were often very amusing. The jury awarded the plaintiff $250, which was, of course, a practical victory for the smelting company. (From *Engineering and Mining Journal,* 1914.)

Treating Phosphate Rock.

Classified lists of the processes already devised for the manufacture of phosphatic fertilizers, and brief discussions of some of these processes, are given in a new professional paper of the United States Department of Agriculture, Bulletin No. 312. These lists have been prepared because it is believed that a better acquaintance with what has already been done in this line would save the useless repetition of much work.

At the present time by far the greater part of the phosphate fertilizer is derived from phosphorite or amorphous phosphate rock, of which there are enormous deposits in the United States. The location and character of these deposits are also discussed in the bulletin already named. Their value depends primarily on the grade of the rock, but its accessibility and the distance to market are also factors of great economic importance.

The various methods for treating the phosphate rock are divided in the bulletin into ten classes as follow:

(1) Acid treatment, which includes the manufacture of superphosphate and phosphoric acid; (2) combined heating and acid treatment; (3) double decomposition by means of a silicate or an alkali; (4) processes used in connection with the steel industry; (5) processes in which the phosphorus or phosphoric acid is volatilized; (6) treatment dealing with the production of two or more fertilizer elements; (7) electrolysis; (8) enrichment or concentration of phosphates; (9) processes and apparatus for the mechanical treatment of phosphates; (10) miscellaneous processes.

In the appendix are tables giving in chronological order the patents granted for various methods for treating phosphate rock, together with a brief description of the various principles employed and the object of the process.

A SPECIAL LECTURE AT THE PHILADELPHIA COLLEGE OF PHARMACY.

Europe in War Times.

Professor Charles E. Vanderkleed left America on February the second, on the *Ryndam* of the Holland-America Line, in the interest of the H. K. Mulford Company, of which firm he is the chief chemist, three days' notice being all that was given to him for preparation.

Considerable excitement was created on the steamer on the 8th of February, by the reception by "wireless" of the news that Germany had declared all the waters around England a war zone, to go into effect on the 18th. Fortunately all danger of being torpedoed was escaped by the vessel reaching Holland on the 15th.

He spoke of the care taken by the Holland-America Line of the lives of the passengers while crossing the North Sea. All the lifeboats were uncovered, ready to be swung out, and the crews were stationed by them. The captain, pilot, and all the officers were on the bridge with rifles in their hands, so that if a floating mine was sighted in a position difficult for the steamer to avoid it might be exploded by a rifle bullet.

He said that his trip abroad was for purely commercial purposes, and he had not the opportunity to investigate things deeply. As an American of Dutch descent he was thoroughly neutral, as was also the Dutch nation, although it had a serious problem to contend with. He specially admired Dutch diplomacy: the men in charge of the Foreign Office had handled their difficult problems well; they have succeeded in remaining on friendly terms with Germany as also with England; anything less would have caused the wiping out of Holland.

At Frankfürt the principal object of interest was the Ehrlich Institute, where he had the honor of meeting Professor Paul Ehrlich (of salvarsan fame), who has since died. Professor Vanderkleed spoke of the great reverence shown him by the students and said that if students in America would show the same reverence for their professors as was shown at the Ehrlich Institute, then teaching would be an ideal thing.

At Berlin he attended a meeting of the German Pharmaceutical Association, on invitation of Professor Thoms, who was to deliver that evening an address on the "Newer Remedies" of 1914. The meeting was considerably different from that of a meeting of the Philadelphia Branch of the American Pharmaceutical Association. It was formal, oppressively formal. At the close of the meeting a gentleman got up and offered the customary resolutions of thanks and the meeting adjourned. The men who attended were all older men. The next day he went out to Dahlen, a suburb of Berlin, and was taken all over the Pharmaceutical School of the University of Berlin. It was a beautiful institution, beautifully equipped, but perhaps not better than our institutions here for teaching pharmacy.

Professor Vanderkleed then made a trip to Denmark and Sweden. If it was hard to get out of Germany into Holland, it was decidedly harder to get into Denmark. The examination given him was a kind of third degree.

When he returned to Berlin he saw many evidences of the war: he saw the hospitals, the wounded soldiers, regiments marching to the front, pathetic sights. When a regiment starts for the front their friends decorate them with flowers, even in early spring time. There is little noise. War with them has settled down to business; the band generally plays a Sousa march or something resembling it.

On the way home he passed through Switzerland, where everything is at a standstill, as they get no supplies from outside the country. The Swiss, however, seem care-free and happy; there was no danger of their getting into the war, as none of the warring nations want the job of going over the Alps. In Berne he had a delightful interview with Professor Tschirch, who desired to be remembered to "*Mein Freund*," Professor Remington.

Passing through Italy on his way home, he found the people in the throes of the excitement of going to war. War had not been declared, but the excitable Italian nature was crying to get into the war; there was nothing to do but to let them fight.

As his first view of the war zone was English, his last view was of England's Gibraltar, solid as a rock. He could not but think of what Gibraltar stands for—the principles upon which the English Government and ours are builded.

In concluding, he said: "What about America in this war? Several things are needed over here in order to take advantage of the situation—not to take advantage in an unfair way, but it is the duty of America to step in and fill her place. There is an opening here for various lines of industry, including pharmacy and chemistry, to take advantage of this situation in a proper manner.

"The American Government must come to the aid of our manufacturers and enable us to get on a sound foundation. We must have revision of our patent laws in such a way that we will not grant patents to foreigners unless the products are manufactured in this country, and thus prevent the condition of want that is staring Americans in the face to-day. Then, too, we must have the coöperation between those big industries whereby all the various products can be utilized."

He concluded his address by picturing the most beautiful sight that he saw on his whole trip. He said: "I arrived in America on the 16th of May, late at night; the steamer anchored over night, and early next morning was ready to go up the harbor to New York.

Getting up early and going out on deck, I heard the boom of the sunrise gun, and, looking out over the water, I saw the Stars and Stripes fluttering to the top of the flagpole at Fort Wadsworth. I stood at attention and I saluted the flag, and I said, 'The hope of the world.'"

C. B. Lowe.

OBITUARIES.

Charles E. Bessey.

Charles Edwin Bessey, an honorary member of the Philadelphia College of Pharmacy and one of the most distinguished botanists of America, was born May 21, 1845, in Milton Township, Wayne County, Ohio. His father, Adnah Bessey, and his mother, Margaret Ellenberger, migrated from western Pennsylvania about ten years earlier and were married about 1841. The father received a college training for two years, but this was not completed, owing to the removal to Ohio just alluded to. Both father and mother were of German and French descent, with the Germanic predominating. The name Bessey is French in its original form, de Bessé, belonging to a family of French Huguenots living in Alsace and who fled to England toward the end of the seventeenth or beginning of the eighteenth century on account of religious persecution.

Adnah Bessey's father was a weaver, and, though Adnah himself was a farmer, he was a skilled surveyor as well, and as such was in demand through the vicinity. He was much interested in science, and early inspired a love of it in his oldest son, who thus received, in addition to the country-school education, an inclination towards science which eventually determined his career. After finishing the country school, the subject of this sketch entered the academy and completed the course there, spending part of one or two years in school teaching to help earn his way. The death of his father in 1863 left him responsible for the care of the farm and the younger members of the family, as well as his mother. In the fall of 1865 he accepted employment with a surveyor and spent nearly a year assisting him in surveying forest lands in the then limits of civilization in north central Michigan. In the course of this work, which involved surveying, estimating timber, etc., he made many observations which were of value in his later life. Work becoming slack, he decided to study further to better fit himself for civil engineering work, and so, on the advice of his employer, entered the Michigan Agricultural College of the middle of the freshman year in the summer of 1866. Much to his disappointment, he was not allowed to select a special course in engineering subjects, but was compelled to take the regular course required of all. It was not long, however, before the love of botany which had always been present manifested itself, and some time before he graduated in November, 1869, he had determined to devote himself to this science. His winter vacations he spent as a school teacher, thus earning the money by which he paid his way through college.

Shortly after graduating, while acting as an assistant in the Horticultural Department, he was offered the professorship of botany and horticulture at the Iowa State Agricultural College at Ames, where he assumed the duties in February, 1870. In the meantime, however, the president had selected Professor J. L. Budd as professor of horticulture, so, on assuming his position, he was required to teach botany and zoology, including entomology, instead of botany and horticulture, for which he was employed. Although he did good work in these other subjects, giving the first training to such men as Hornaday, of the New York Zoological Gardens and Osborn, of the Ohio State University, yet botany was his special love.

He early saw the futility of teaching the subject without laboratory work, and he was one of the first in the country to require laboratory work in the subject, beginning this with the use of the compound microscope in the year 1872 or 1873.

In 1880 he published a text-book in botany, based largely on the results of the German investigations and putting in print in the English language, for the first time, a text-book in which laboratory work was required and in which the study of lower plants and the structure and physiology of plants were made a large part of the course. This was followed, in 1884, by a shorter edition of the book, "The Essentials of Botany," of which seven editions appeared, the eighth edition in collaboration with his son, Ernst A. Bessey, having appeared in the fall of 1914.

While in Iowa he identified himself with the educational improvements, as well as the agricultural and horticultural societies, and was probably the prime mover in founding the Iowa Academy of Science.

Under his investigations the flora of Iowa began to be well known, not merely the higher plants, but also the lower plants, while studies were made of the natural forage plants of the State.

In the fall of 1884 he accepted the position of Professor of Botany and Dean of the Industrial College of the University of Nebraska, remaining there until his death, February 25, 1915. Three times he was made acting chancellor, and would have been made chancellor of the University except for the fact that he preferred the botanical work with less salary to the administrative work as chancellor.

As upon going to Iowa, when he went to Nebraska, he associated himself at once with the horticultural and agricultural societies, and also helped establish the Nebraska Academy of Sciences, of which he was president several times.

In Nebraska he gave great attention to forage plants and to the question of reforestation, being largely responsible for the setting aside of a forest reservation, which, unlike others, is one where trees are to be planted.

In the Department of Agriculture, and in various colleges and universities throughout the country, there are many who were formerly his students, both in Iowa and Nebraska. It is through these that his influence is spread, perhaps more than through his own investigations, for, though he was a skilled investigator, he could never bring himself to neglect his students for the advantage of his investigations, and any student who needed help would be permitted at almost any time to disturb his own work. His life may be summed up in what were almost his last words a day or two before his death, that " He pitied the teacher who used his position for his own self-advancement instead of giving all his energy to the helping of the students whom he was supposed to teach "; and again, " The whole philosophy of life is summarized in this one word, love."

Professor Bessey was married on December 25, 1873, to Miss Lucy Athearn, of West Tisbury, Mass. There were three sons, of whom the oldest, Edward, was assistant professor in charge of the electrical engineering course at Colorado Agricultural College at the time of his death in 1910. The next son, Ernst, has been since 1910, professor of botany at the Michigan Agricultural College, his father's Alma Mater, and the third, Carl, is an electrical engineer in Chicago.

Jacobus Polak.

Jacobus Polak, a corresponding member of the Philadelphia College of Pharmacy and a renowned pharmacist and chemist of Amsterdam, Holland, died on May 25, 1915, at the age of seventy-five. He became a pharmacist at the age of twenty, and soon evinced a great interest in the educational and professional side of his calling. For many years he was chairman and member of the Board of Directors of the Nederlandsche Maatschappij ter bevordering der Pharmacie. As showing the nature and extent of his services upon his retirement from active work, the members elected him an honorary member. His efforts were, however, not confined to the drug business alone, as he was for some twenty years a member of the Municipal Board of Amsterdam. For fifty years, he was the member of the committee to pass on licentiates in both medicine and pharmacy. Dr. Polak was a man of great nobility of character, broad sympathies, and a public servant. He published a great many scientific articles, and prepared a number of addresses of lasting value. His influence on pharmacy extended beyond the Netherlands, and his name and fame are international. At the time of the celebration, in 1910, of his fifty years' jubilee as pharmacist, he retired from public life, and devoted his closing years quietly among his books and his friends.

Charles G. Dodson.

Dr. Dodson graduated from the Philadelphia College of Pharmacy in 1859. A native of Bristol, he came to Philadelphia early in life and took up the study of pharmacy. Shortly after his graduation he started in business, and for many years was associated with Frederick Brown, '61, in the wholesale and retail drug business at Fifth and Chestnut Streets. About twenty-five years ago the business was moved to 127 South Fourth Street, and a few years afterward Dr. Dodson acquired the Brown interests.

Charles L. Eberle.

Mr. Eberle was a pioneer Germantown druggist, and one of the foremost residents of this portion of the city. At the time of his death he was seventy-seven years of age. Mr. Eberle had been identified with the schools and various civic enterprises for over half a century. He was born in Germantown, but was early apprenticed in the drug business in Lancaster, Pa. He later came to Philadelphia and was graduated from the Philadelphia College with the class of 1859. Mr. Eberle purchased a drug store from Abram Rex at Germantown Avenue and Church Lane in 1859. It was the only drug store in Germantown at that time. Mr. Eberle continued as the proprietor of this store for forty years, retiring in 1899. During his earlier years he was active in College and Alumni Association work, serving on the Board of Trustees of the College, and in various official capacities in the Alumni Association, holding the office of president for a number of years. He also contributed to pharmaceutical publications, and a few years ago he prepared a summarized history of Germantown.

William H. Lacey.

William H. Lacey, aged sixty-four years, for many years a member of the College and for many years a practising pharmacist at Nineteenth and Green Streets, Philadelphia, Pa. Mr. Lacey became the manager of this store in 1873 and the owner in 1880. The secretary of the College, Dr. C. A. Weidemann, paid an unusually high tribute to his memory in saying that " Mr. Lacey was highly esteemed in his neighborhood, and conducted his store very successfully and honorably."

George Jones Scattergood.

Mr. Scattergood was a Philadelphian, receiving his education at the Friends' Select School. Later he attended the Westtown Boarding School. In 1852 he became an apprentice of Charles Ellis & Co., on Chestnut Street above Second. In the autumn of 1854 he matriculated at the Philadelphia College of Pharmacy, and was graduated with highest average in his class in 1856, and became a member of the College in 1859. Soon after his graduation he became a successful retail druggist at the northwest corner of Fifth and Callowhill Streets. In 1860 he was admitted into the firm of Carter & Scattergood, manufacturing chemists, at twenty-fourth and Bainbridge Streets, where he continued until 1890. Having accumulated an estate sufficient to satisfy his moderate desires, he retired from active business and devoted his time and talents to the promotion of various charitable, educational, and religious works.

George J. Scattergood was noted from quite early life for strict integrity and sincere loyalty to the doctrines and testimonies of the Society of Friends, of which he was a member. His fellow-members loved and appreciated him highly, bestowing upon him many important offices and appointments, the duties of which he performed with fidelity and marked ability.

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PHARMACOPŒIAL STANDARDS FOR WHISKY AND BRANDY.

By George M. Beringer, A.M., Ph.M.

The resolutions adopted by the various associations of druggists in favor of the retention of standards for whisky and brandy in the United States Pharmacopœia indicate that this is considered one of the topics in which pharmacists are especially interested.

The question of proper pharmacopœial standards for these distilled liquors has been unnecessarily beclouded by other questions that have been introduced in the discussion.

As the member of the Committee of Revision to whom was referred the subject of standards for whisky and brandy, I am of the opinion that there should be presented, for the benefit of the interests engaged in the discussion, a review of the studies this assignment entailed. Hence I have concluded to publish an abstract of the " Report of the Referee on Whisky and Brandy."

The preparation of a satisfactory monograph on whisky is beset with peculiar difficulties. The referee admits that it has been one of the most perplexing of the many pharmacopœial problems with which he has been personally associated.

Considerable of the literature on the subject has been written in behalf of trade interests engaged in a strenuous effort to obtain commercial advantages, and is so tinctured with partisanship as to becloud the scientific facts necessary for a pharmacopœial standard. The Pharmacopœia *must not become entangled in any such trade controversies.*

The referee believes that it is his duty to present a report that shall be based upon an impartial study of the subject and upon the actual data obtained by examination of commercial products of satisfactory quality. What is needed is a definition, description, and tests that shall correctly define, cover, and include any properly-produced whisky that may be dispensed when " Spiritus Frumenti " is *prescribed for medical purposes,* irrespective of which cereals were used in the mash or what form of apparatus was used in the distillation, or the State or country where it was produced. Such a standard, to be satisfactory, must be based upon such facts as are fully established, and not upon academic theories or preconceived views.

The following general observations are initial propositions which have a bearing on this question. These must be given due consideration as having a decided influence on the draft of a pharmacopœial standard. They further serve to illustrate some of the difficulties of the problem.

Whisky is of such a complex chemical composition that it is difficult to compass it by the ordinary rules of procedure of the pharmacopœia. Approximately, about 99 per cent. of whisky is a mixture of ethyl alcohol and water which our accepted methods enable us to determine with sufficient accuracy. The remaining 1 per cent. or less consists of non-volatile extractives and numerous volatile constituents of complex and more or less unknown composition and present in ever-varying proportions. The presence of these volatile substances, which in the more recent literature have been named " congeners," in at least a substantial amount is essential to whisky.

The causes of congeneric variation are numerous. The various mixtures and quality of the grains used and the proportion of diastase in the mash, the character of the yeast, the time and temperature of the fermentation, the method of distillation, the distilling apparatus, and even the atmospheric conditions are factors permitting of innumerable changes and consequently innumerable variations in the amount and character of the congeners present in the product.

It is difficult to gauge the degree to which rectification and compounding have been carried on, or to what extent these should be restricted. For several centuries the trend of the manufacture of whisky has been toward either the masking of, or the elimination of a portion of, the congeners. The earlier attempts to render distilled spirits potable were efforts to overcome or drown out the obnoxious odor and taste in the crude distillates of those days by the addition of aromatic and sweetening flavorings in relatively large amounts.

These attempts at masking were soon supplanted by improved methods of manufacture that aimed at the elimination of a large portion of the congeners produced. The first step to be applied in the process of elimination was fractionating the distillate by which the aldehydes and " fusel oil " congeners were largely separated in the rejected fractions. In the whisky industry, as in other industries, marked progress has taken place in the character of apparatus and machinery employed. In modern distilleries the improved column still has generally replaced the older types of stills.

The second step in the progress of elimination of " fusel oil " congeners is rectification. Originally, this was carried on as a distinct industry in an establishment entirely separate from the distillery. Rectification originally consisted in passing the grain distillates through a series of leaching tubs containing charcoal. Since 1872 the government has sanctioned, by congressional enactment, the use of improved apparatus by which the rectification may be carried on at the distillery as a part of the process of manufacture, thus combining in one completed operation both the distillation and the rectification.

During all of these years the effort has been to eliminate as much of the higher alcohols, " fusel oil," as possible. The tendency of the manufacture of whisky has been gradually but surely toward the production of a " lighter " or milder type of distilled spirit from grain, and the taste of the public has been cultivated in that direction.

The taste of the public has likewise been cultivated toward the modified flavors produced by " blending," in which the art of the compounder is exhibited. It is estimated that probably 90 per cent. or more of the whisky consumed is blended or mixed grain distillates.

In its standard, the United States Pharmacopœia must necessarily recognize the changes that have occurred in the character of the product known as whisky because of improved apparatus and processes, changes in trade conditions, and the demands of cultured palates. Its standard must, of necessity, define what is actually in the market and what is used in medical practice, and not what was originally known as whisky or the primitive " usquebaugh."

It is likewise difficult to gauge the changes due to the aging or maturing of whisky and to determine the proper minimum age limit.

It may be considered as universally conceded that the palatability of whisky is improved by, if not mainly due to, changes which occur during the period of maturing or storing. To what modification of its components or to the production of which "secondary products" this improvement is due cannot be definitely stated.

The changes that take place during the aging are, as yet, but imperfectly known. However, we do know something of these and of their effect on the potability of the whisky. The distilled spirit dissolves out of the wood a small amount of tannin, wood extractive, and color, and acquires a distinct woody flavor, detectable by both taste and smell. The color and flavor are materially influenced by the extent of the charring of the interior of the barrel, and the wood extractive is increased by elevating the temperature, by agitating the barrels, and by extending the period of storage. In whisky that has been matured in oak barrels, the woody flavor is not only distinctly perceptible in the liquid but persists in the residue left on evaporating a portion on the water-bath. The tannin, wood extractive, and coloring thus acquired are undoubtedly *additions* to the distilled spirit, but, by reason of the many years that this practice of storing in wood has been carried on, these have become considered as *essential ingredients,* and the associated woody flavor is accepted as part of the composite flavor of whisky.

The percentage of acid present in whisky at the time of its distillation is variable, depending on the extent to which the fermentation has been carried. During the period of storage the acidity is increased for several years by the gradual oxidation of a portion of the alcohol and thereafter appears to remain stationary. Esterification is likewise gradually going on during the maturing period, and the acids consumed in this process probably compensate that which is continuously formed by oxidation. The esters formed play an important part in modifying the odor and taste of the product.

Chemists estimate the acids present as acetic acid and the esters as acetic ether. Nevertheless, it is well known that other acids are present in small amounts and also that a series of higher alcohols, collectively spoken of as "fusel oil," are present in relatively minute quantities, and that these are subject to the same chemical changes as is the acetic acid and the ethyl alcohol; consequently the production of a number of compound ethers must be conceded. These acids and esters aid materially in rendering the spirit potable by adding the flavor or bouquet thereto, and, although strictly *additions,* they are considered as *essential ingredients* of whisky.

The Federal laws relating to distilled spirits have been enacted primarily for the purpose of collecting the tax thereon, and only incidentally do they consider the question of standards. From the viewpoint of the revenue collector, the tendency would be to encourage the production and to broaden the definition of whisky so as to include the widest range of alcoholic distillates that could be used under that title. The pharmacopœial viewpoint is the necessity of fixing a reasonable and practical standard of purity and quality for a product used for medical purposes.

For beverage purposes a wider latitude could with safety be permitted than would be permissible in a standard for a medicinal article. The requirements for whisky as a medicine should be more restricted and exacting, as in such use there is constantly present the necessity for estimating its pharmacodynamic action. With beverages the pharmacopœia is not concerned, nor does its authority contemplate the control of standards for such purposes. For this reason there should be incorporated in the monographs on Whisky and Brandy a statement that the standards are applicable to these products when prescribed for medical use.

The pharmacopœial standard should be correct, reasonable, and practical, and should work no unnecessary hardship on the producer and should protect the pharmacists from uncalled-for prosecutions. The manufacture of whisky is a legalized industry commonly conducted on a very large scale and with enormous investments. The quantity of whisky consumed as a medicine bears but a very small ratio to the total production. The pharmacist is limited in his source of supply, and, even under the most favorable conditions, he can have little or no influence on the quality of the commercial product.

It is exceedingly rare for the physician, in prescribing whisky, to specify any brand, kind, or age. Rarely does he write more specifically than for " Spiritus Frumenti," thus casting the responsibility entirely upon the pharmacist, who in turn relies upon his source of supply, the wholesale druggist or the wholesale liquor dealer. Under the law, the pharmacist is responsible for the quality of the medicines that he dispenses. The duty of the pharmacopœia is to supply a proper standard that will not unnecessarily restrict his supplies and will enable him to form a correct judgment of the purity and quality, so as to protect the dealer and consumer from deception. "Such a standard should be sufficiently liberal to enable compliance without becoming burdensome, but at the same time constitute a safeguard against the use (medically) of the compounds commonly sold under the name of whisky."

Accepting the monograph on Spiritus Frumenti of the U. S. P. VIII as the basis for a revised monograph for the U. S. P. IX, a critical examination of the language and statements contained in the article on whisky now official appears to be imperative. Equally important is the confirmation of these statements by the results of examinations of commercial products. Attached to this report is a synopsis of recent examinations of nearly two-score samples of commercial whiskies. This serves to illustrate some of the criticisms presented.

> The Title.—"Spiritus Frumenti," literally "spirit of grain," is appropriate and should be retained.
>
> The Definition.—"An alcoholic liquid obtained by the distillation of the mash of fermented grain—such as Indian corn, rye, wheat, and barley, or their mixtures."

This is subject to several criticisms. Whisky must be *potable*, and "an alcoholic liquid obtained by distillation" as prescribed is not the whisky contemplated until rendered *potable* by reduction to the proper alcoholic content and matured, and this distinction should properly be included in the definition.

As it is the mash that is fermented, the wording should be changed from "mash of fermented grain" to "*fermented mash of* ——"

The minimum period of aging should be a *requirement* of the definition and *not a recommendation* included in the description, and accompanying such a statement in the definition should be added such restrictions on the method of aging as it may be deemed wise to officially require.

> The Description.—"An amber-colored liquid, having a distinctive odor and taste, and a slightly acid reaction."

The statement as to color is probably as clear and descriptive as it can be made, as the varying depths of color or shades of amber permissible cannot be described, and colorless distillates are excluded.

The statement here as to acidity is likewise accepted.

The statement, however, regarding odor and taste is subject to the criticism of being too general and too indefinite a description of the odor and taste of whisky. It might be claimed that the "distinctive odor and taste" is the distinctive odor and taste of ethyl alcohol, which is the predominating ingredient. I would recommend that this be modified to read—"having the odor and taste of diluted alcohol, modified by flavors derived from the grain, extractives from the wood and substances naturally formed during the storage."

> "Its specific gravity should be not more than 0.945 nor less than 0.924 at 15.6° C. (60° F.), corresponding, approximately, to an alcoholic strength of 37 to 47.5 per cent. by weight or 44 to 55 per cent. by volume of absolute alcohol."

This statement follows the customary method of determining the alcoholic content of such distilled spirits by taking the specific gravity of the liquid by any of the accepted ways and calculating from the alcohol table the percentage of alcohol present. This ignores the variation introduced by the content of solids and the modifying influences of the other volatile substances present. This error is certainly very slight and, with the restrictions on solids proposed, will be reduced to a minimum that is negligible, and, as the method has the sanction of governmental and business usage, it can be continued.

The permissible alcoholic content, "44 to 55 per cent. by volume," is entirely too wide a range for a medicinal product. A whisky of 110 proof is entirely too strong for consumption and verges on the border of being non-potable on that account. A number of the samples examined (notably Nos. 13, 14, 15, and 16) were stored goods not yet reduced, and the taste of these showed distinctly the undesirability of such high alcoholic content. The bulk of the whisky is sold to the consumer at 90 to 100 proof (45 to 50 per cent. alcohol by volume), and the pharmacopœial range of alcohol content should not vary greatly therefrom. From 45 to 51 per cent. would be a proper limitation.

The present method of stating gravity at the temperature of 15.6° C. is continued in the monograph submitted, although the preference of the referee would be to give this at the official normal temperature.

> TESTS.—"If 100 Cc. of whisky be very slowly evaporated in a tared dish on a water-bath, the last portions volatilized should not have a harsh or disagreeable odor (absence of more than a trace of *fusel oil* from grain); and the residue, when dried at 100° C. (212° F.), should not weigh more than 0.5 Gm. This residue should have no sweet or distinctly spicy taste (absence of *added sugar, glycerin,* and *aromatic substances*), and it should almost completely dissolve in 10 Cc. of cold water, forming a solution which is colored not deeper than light green by a few drops of ferric chloride T. S. diluted with 10 volumes of water (absence of more than traces of *oak tannin* from casks)."

This paragraph contains some misleading statements and merits the most critical scrutiny. The first statement therein is given as a test for the absence of more than traces of fusel oil. This is only one of the organoleptic tests that have been proposed for detecting fusel oil. It is comparable with the evaporation of a portion of the spirits by rubbing on the palm of the hand or evaporation on a piece of bibulous paper, and is unscientific and insufficient for the purpose proposed. Relatively large amounts of fusel oil would escape detection by such a crude method.

If only a qualitative method is to be adopted for the detection of excess of fusel oil, there are several tests which are preferable; for example, either of the following:

1. 20 Cc. of the sample mixed with 50 Cc. of distilled water in an Erlenmeyer flask and heated to 25° C., the contents then violently shaken and the odor and taste noted.

2. Shake 10 Cc. of the sample with 20 Cc. of water and 10 Cc. of ether. Allow the mixture to stand, separate the ether layer, and evaporate this on a watch crystal. No odor of fusel oil should remain after the ether has evaporated.

If it is desirable to retain only one qualitative test for this purpose, I would prefer the latter.

In the Eighth Revision of the U. S. P. the residue from 100 Cc. of whisky was increased from 0.25 Gm. to 0.5 Gm. The reason for this change is not evident. Properly-made whiskies, even after long storage in wood, do not yield residues approaching this maximum. Blended whiskies and compounded whiskies, to which excesses of coloring and flavoring have been added, may yield a residue of 0.5 Gm. or even greater.

Sample No. 13, which was stored more than six years in wood, yielded only 0.260 Gm., and if reduced to 50 per cent. alcoholic strength the residue would have fallen below 0.250 Gm.

Sample No. 26, after six years' storing, residue 0.210 Gm.

Sample No. 6, seven years old, residue 0.233 Gm.

Of the blended whiskies, which contained added coloring and flavoring, the residues frequently exceeded 0.5 Gm. This is seen in Samples Nos. 19, 20, and 33.

With entire safety the residue from 100 Cc. of whisky can be reduced to 0.3 Gm., or even to the old standard of 0.25 Gm. Any whiskies exceeding this limit would show the presence of added foreign materials.

The residue also gives us valuable information as to the character of the whisky. In a whisky consisting entirely of grain distillates aged in wood the residue is brown in color, dry, and scattered over the bottom of the evaporating dish in leaf-like patterns or spotted deposits. Whiskies containing added caramel coloring leave a more or less shining, deep-brown residue. If only a small amount of caramel is added it is insufficient to entirely destroy the characteristic appearance of the residue described above, and the residue exhibits in spots the characteristics of both kinds of coloring. If the coloring is entirely caramel, or if the caramel is in excess, then the residue is in the form of a shining, smooth solid extract more or less pasty and sweet, especially if prune juice or similar material has been used as a flavoring.

The requirement that the "residue should have no sweet or distinctly spicy taste (absence of *added sugar, glycerin,* and *aromatic substances*)" is correct and should be retained.

The next requirement, however, that "it should almost completely dissolve in 10 Cc. of cold water," is not correct. In compounded whiskies in which the residue is composed largely of added coloring and flavoring the residue is practically entirely soluble. However, in whiskies in which the residue is due to material absorbed from the wood during storage, this is not true. A reference to the appended report will show that in those whiskies which are compounded the *insoluble residue* is very scant. In the examination of these samples the insoluble portion of the residue was determined in a number of cases. The residue left on evaporation was thoroughly rubbed down with 20 Cc. of distilled water, filtered, and the dish and filter washed with an additional 5 Cc. of water. In a number of these samples the *insoluble residue* amounted to from *19 to 40 per cent. of the* residue. This statement must be either eliminated or amended to comply with the facts.

Exception must likewise be taken to the next statement, that the solution of the residue in water " is colored not deeper than light green by a few drops of ferric chloride T. S. diluted with 10 volumes of water." In all whiskies which are aged in wood for four years or more sufficient of the wood tannin is absorbed to give in this test a distinct greenish-black coloration. In compounded whiskies this color is usually brown, with little or no distinct green tint. The pharmacopœial statement, instead of being a negative one, should be a positive one, requiring that the solution of the residue *must yield a green coloration* on the addition of ferric chloride T. S., as an evidence of the proper maturing of the whisky by storage in wood. The limitation on the amount of residue will eliminate the possibility of an excessive amount of tannic acid.

> " If 50 Cc. of whisky be shaken vigorously in a stoppered flask with 25 Gms. of kaolin, and, after standing half an hour, be filtered, the color of the filtrate should not be much lighter than that of the whisky before treatment."

Exception is taken to this test for caramel. If kaolin of proper absorptive test be used in the quantity directed, the result will be a magma from which very little liquid can be filtered. If the test be retained, then it should be changed, directing 5 Gms. kaolin to 50 Cc. of whisky. It is to be noted that a *slight reduction* in the coloring occurs with all samples of whisky.

The color in whisky is due to added coloring, either caramel or that dissolved from the charred barrel. The use of caramel antedates by many years the use of the charred barrel for this purpose. Either of these colorings is harmless, and their use has been sanctioned by Federal statutes and decisions. If the entire residue consisted of coloring, it would not amount to more than from 0.2 to 0.3 per cent. Since the amber color is required, it is immaterial if this color be produced by the addition of small quantities of burnt sugar or of a similar coloring substance prepared by charring wood. The quantity of either of these present in whisky answering the pharmacopœial requirements would be exceedingly small. Since both are harmless and the use of caramel is provided for by laws and regulations of the government, I doubt the wisdom of the Pharmacopœia adopting a provision that would exclude caramel from whisky and raising an issue between its standard and the government enactments. My recommendation is, that this paragraph relating to test for caramel be eliminated from the pharmacopœial tests.

> "To render 100 Cc. of whisky distinctly alkaline to litmus, not more than 1.2 Cc. of normal potassium hydroxide V. S. should be required (limit of *free acid*)."

A compound whisky with practically no acid or an immatured whisky would meet this requirement, as no minimum limitation is fixed. On the other hand, some very good grades of whisky may slightly exceed this percentage of acid. (Note samples Nos. 21, 22, and 23.) It is to be noted that the compounded and blended whiskies are exceedingly low in acid content, as, for example, samples Nos. 32, 33, 37, and 39. A minimum and a maximum limit should be given, and the maximum might with safety be somewhat increased.

The method of applying this test is misleading. On adding solution of potassium hydroxide to whisky the amber color is deepened and it is difficult to note the end reaction. Litmus is not a good indicator for the purpose. I would recommend that in stating this test 100 Cc. of whisky be diluted with 200 Cc. of distilled water and the titration be made with tenth-normal potassium hydroxide V. S., and that phenolphthalein T. S. be used as indicator. The reaction is far more distinct under these conditions than would be possible with the present directions.

To meet the criticisms and comments as submitted above, the following monograph is reported:

SPIRITUS FRUMENTI.

WHISKY.

A potable alcoholic liquid obtained by the distillation of the fermented mash or mashes of cereal grains (wholly or in part malted)—such as maize, rye, wheat, and barley, or their mixtures. Whisky intended for administration as a medicine should have been stored in wood containers for a period of not less than four years before it is used, and should conform to the following characters and tests.

An amber-colored liquid, having the odor and taste of diluted alcohol modified by flavors derived from the grain, substances extracted from the wood or naturally formed during the storage, and a slightly acid reaction.

Its specific gravity should be not more than 0.943 nor less than 0.932 at 15.6° C., corresponding, approximately, to an alcoholic strength of 38 to 43.5 per cent. by weight or 45 to 51 per cent. by volume of absolute alcohol. (See Appendix, Alcohol Tables, page —.)

Shake thoroughly 20 Cc. of whisky, 20 Cc. of distilled water, and 10 Cc. of ether; allow the mixture to stand until separation has taken place. Separate the ether layer and allow it to evaporate spontaneously on a watch crystal; the residue should not have a disagreeable or irritating odor (excess of *fusel oil*).

Evaporate 100 Cc. of whisky in a tared dish on a water-bath and dry the residue at 100° C. to constant weight; it should weigh not more than 0.3 Gm. This residue should not have a distinctly sweet or spicy taste (absence of *added sugar, glycerin,* and *aromatic substances*). If the residue be treated with 10 Cc. of cold distilled water, the filtered solution should give a greenish-black coloration upon the addition of a few drops of diluted ferric chloride T. S. (1 in 10) (*oak tannin* from barrels).

100 Cc. of whisky diluted with 200 Cc. of distilled water should require for neutralization not less than 6 Cc. nor more than 15 Cc. of tenth-normal potassium hydroxide V. S., using phenolphthalein T. S. as indicator (limit of *free acid*).

BRANDY.

The statements in the preceding part of the report, although written on the subject of whisky, apply with almost equal force to the subject of brandy. A few additional comments, however, are necessary upon a proper monograph for brandy.

TITLE.—The pharmacopœial title, Spiritus Vini Gallici, has been retained in the United States Pharmacopœia and in the British Pharmacopœia. As it is not the intent to restrict the brandy of the Pharmacopœia to French brandy only, "Gallici" should be taken out of the title. For the same reason, the synonym, Cognac, should not be given in the Pharmacopœia. A change in the pharmacopœial title evidently is necessary. The Austrian Pharmacopœia restricts its brandy to the cognac, and takes as the title, Spiritus Vini Cognac. The German Pharmacopœia and the Swiss each takes as titles, Spiritus e Vino," with "Kognac" and "Cognac" as synonyms. Neither of these seems to be acceptable for the U. S. P.

It has been suggested that the title be made Spiritus Vini, but this is very objectionable, because the title, Spirit of Wine, is commonly applied to alcohol, and its adoption for brandy would lead to serious confusion. Chairman Diehl has suggested as a title, Spiritus Vini Vites Viniferæ. This title appeals to me, but we are confronted by the fact that the *Vitis Vinifera* and its cultivated varieties are not the only grapes from which brandy is made. The American species, *V. Labrusca* and *V. æstivalis,* and cultivated varieties are also sources from which many wine grapes are now cultivated. For this reason, the validity of the title suggested by Chairman Diehl may be questioned.

Your referee is of the opinion that a distinctive title should be coined for brandy that would designate it as a spirit of grape wine, and would not restrict brandy to that produced in any one country or district or that from any one grape. This leads to a suggestion that the title be made Spiritus Vini Vitis.

It is well known that French brandy has always been colored with caramel, and that a special syrup of sugar partly caramelized is used for this purpose. The Austrian Pharmacopœia and the Swedish Pharmacopœia, recognizing this fact, permit in their official brandy, which is cognac, a residue of 1.5 per cent. The U. S. P. of 1890 likewise permitted a residue of 1.5 per cent., and none of these pharmacopœias have tests that would exclude the presence of caramel. The U. S. P. VIII reduced the allowable residue to 0.5 Gm. in 100 Cc., and included the kaolin test for the presence of caramel coloring. In the list of Additions and Corrections promulgated by the Committee of Revision on May 1, 1907, the caramel test was deleted. It is difficult to understand why the U. S. P. VIII should attempt to preclude the use of the finer types of French brandy by restricting the solid content, and likewise why, after having once recognized the error of the caramel test and deleted it from the U. S. P. VIII, it should be proposed to now reincorporate this test in the U. S. P. IX.

The following monograph with the proposed title is respectfully submitted:

SPIRITUS VINI VITIS.

BRANDY.

A potable alcoholic liquid obtained by the distillation of the fermented unmodified juice of fresh grapes. Brandy intended for

A SYNOPSIS OF SOME RECENT EXAMINATIONS OF DISTILLED SPIRITS.

Number	Label and locality	Sp. gr. 15.6 C.	Alcohol, per cent. by volume	Color	Color after treating with kaolin	Residue from 100 C.c. in Gm.	Character of residue	Residue soluble in Gm.	Residue insoluble in Gm.	Aqueous solution of residue with $FeCl_3$	Acidity 100 Cc., required N/10 KHO in Cc.
1	Neutral spirit from grain, Cincinnati, Ohio	0.8113	96.1	Colorless	....	0.005	....	....	....	....	0.7
2	Grain neutral spirit, Peoria, Ill.	0.8122	95.8	Colorless	....	0.004	....	....	....	....	0.5
3	Grain neutral spirit, Peoria, Ill.	0.8099	96.5	Colorless	....	0.004	....	....	....	....	0.6
4	Grain neutral spirit, New York, N. Y.	0.8142	95.4	Colorless	....	0.007	....	....	....	....	0.9
5	WHISKIES: Blend A, No. 1 Bourbon, Louisville, Ky.	0.9496	41.5	Amber	Very light amber, nearly decolorized	0.126	Glossy and spotted, faint woody odor, caramel taste	Almost completely	Scant	Brown, scarcely green	5.5
6	R. Co., I. H. Brand, Louisville, Ky., 7 years old	0.9270	53.5	Amber	Only slight reduction of color	0.233	Spotted, dry, brown, woody odor and taste	Only partly	Decided	Green-black	12.3
7	R. Co., I. H. Brand, Louisville, Ky., 5 years old	0.9245	55.	Amber	Only slight reduction of color	0.183	Spotted, dry, brown, woody odor and taste	Only partly	Decided	Green-black	11.
8	R. Co., I. H. Brand, Louisville, Ky., 3 years old	0.9350	49.5	Amber	Only slight reduction of color	0.155	Spotted, dry, brown, woody odor and taste	Only partly	Decided	Green-black	9.5
9	R. Co., I. H. Brand, Louisville, Ky., 2 years old	0.9320	51.	Light amber	Only slight reduction in color	0.175	Spotted, dry, brown, woody odor and taste	Only partly	Decided	Greenish	10.
10	*A*, rye; *B*, D. Co., Louisville, Ky.	0.9430	45.5	Amber	Reduction decided about ½	0.343	Glossy, gummy, caramel-like, sweet	Nearly entirely	Scant residue	Greenish-brown	7.6
11	*A*, Bourbon; *B*, D. Co., Louisville, Ky.	0.9422	46.	Amber	Reduction decided about ½	0.325	Glossy, taste caramel-like, sweet	Nearly entirely	Residue scant	Greenish-brown	6.8
12	*B*, Bourbon; *B*, D. Co., Louisville, Ky.	0.9419	46.	Amber	Reduction very decided, about ⅔	0.335	Glossy, gummy, caramel-like	Partly	Residue scant	Greenish-brown	4.1
13	T. Co., double distilled pure rye whisky, Pittsburgh, Pa., 6 years old	0.9150	59.	Deep amber	Only slight reduction	0.260	Spotted, dry, brown, woody odor and taste	0.220	0.040	Greenish-black	12.2
14	T. Co., double distilled pure rye whisky, Pittsburgh, Pa., 5 years old	0.9230	55.5	Amber	Only slight reduction in color	0.190	Spotted, dry, brown, woody odor and taste	0.140	0.050	Greenish-black	10.2

15	T. Co., double distilled pure rye whisky, Pittsburgh, Pa., 4 years old	0.9240	55.	Amber	Only slight reduction in color	0.210	Spotted, dry, brown, woody odor and taste	0.146	0.064	Greenish-black	12.
16	T. Co., double distilled pure rye-whisky, Pittsburgh, Pa., 3 years old	0.9242	55.	Amber	Only slight reduction in color	0.190	Spotted, dry, brown, woody odor and taste	0.133	0.057	Greenish-black	11.7
17	T. Co., double distilled pure rye whisky, Pittsburgh, Pa., 2 years old	0.9291	52.5	Amber	Only slight reduction in color	0.135	Spotted, dry, brown, woody odor and taste	0.075	0.060	Greenish-black	9.3
18	T. Co., double distilled pure rye whisky, Pittsburgh, Pa., 6 months old	0.9340	50.	Amber	Only slight reduction in color	0.105	Spotted, dry, brown, woody odor and taste	0.089	0.016	Greenish-brown	9.6
19	Blended whisky, C. Co., Baltimore, Md.	0.9423	45.5	Dark amber	Reduction very marked	1.700	Glossy, gummy, sweet, fruity	1.640	0.060	Brown only faintly green	10.6
20	Blended whisky, C. Co., Baltimore, Md.	0.9438	45.	Dark amber	Reduction very marked	1.65	Glossy, syrupy, fruity	1.630	0.020	Brown, only faintly green	12.
21	Eastern rye, New York, 4½ years old	0.9203	57.	Amber	Reduction only slight	0.245	Spotted, dry, brown, woody odor and taste	0.180	0.065	Green-black	16.2
22	Eastern rye, New York, $3^1/_3$ years old	0.9228	56.	Amber	Reduction very slight	0.290	Spotted, dry, brown, woody odor and taste	0.220	0.070	Green	15.6
23	Eastern rye, New York, 2½ years old	0.9294	52.5	Amber	Reduction scarcely noticeable	0.230	Spotted, dry, brown, woody odor and taste	0.175	0.055	Green	15.2
24	Eastern rye, New York, 1½ years old	0.9280	53.	Amber	Reduction scarcely noticeable	0.167	Spotted, dry, brown, woody odor and taste	0.127	0.040	Green	11.3
25	Eastern rye, New York, 6 months old	0.9323	51.	Pale amber	Reduction scarcely noticeable	0.107	Spotted, dry, brown, faintly woody odor and taste	0.082	0.025	Light green	8.
26	H, pure rye, Ohio, 6 years old	0.9114	61.	Amber	Reduction very slight	0.210	Spotted, dry, brown, woody odor and taste	0.145	0.065	Green-black	13.3
27	H, pure rye, Ohio, 5 years old	0.9179	58.	Amber	Reduction very slight	0.202	Spotted, dry, brown, woody odor and taste	0.153	0.049	Green	11.6
28	H, pure rye, Ohio, 4 years old	0.9203	57.	Amber	Reduction not appreciable	0.195	Spotted, dry, brown, woody odor and taste	0.139	0.056	Green	11.2
29	H, pure rye, Ohio, 3 years old	0.9252	54.5	Amber	Reduction not appreciable	0.150	Spotted, dry, brown, woody odor and taste	0.102	0.048	Green	10.2
30	H, pure rye, Ohio, 2 years old	0.9292	52.5	Amber	Reduction not appreciable	0.155	Spotted, dry, brown, woody odor and taste	0.119	0.036	Green	9.9
31	H, pure rye, Ohio, 1 year old	0.9297	52.25	Pale amber	Reduction not appreciable	0.125	Spotted, dry, brown, woody odor and taste	0.083	0.042	Green	10.6

A SYNOPSIS OF SOME RECENT EXAMINATIONS OF DISTILLED SPIRITS.—*Continued.*

Number	Label and locality	Sp. gr. 15.6 C.	Alcohol, per cent. by volume	Color	Color after treating with kaolin	Residue from 100 C.c. in Gm.	Character of residue	Residue soluble in Gm.	Residue insoluble in Gm.	Aqueous solution of residue with $FeCl_3$	Acidity 100 Cc., required N/10 KHO in Cc.
32	Blend, S. Co., Cincinnati, Ohio	0.9430	45.5	Deep amber	Greatly reduced, approximately ½	0.115	Glossy, brown, odor slightly woody, caramel taste	0.095	0.020	Greenish-brown	4.
33	Blend, S. D. Co., Cincinnati, Ohio	0.9387	48.	Deep amber	Greatly reduced approximately ½	0.530	Glossy, only very slightly, woody, gummy, sweet, fruity	.0510	0.020	Dirty brown, faintly green	5.1
34	Blend F, New York	0.9424	45.7	Dark amber	Greatly reduced, approximately ½	0.465	Glossy, brown, sweet, fruity and caramel-like	0.440	0.025	Dirty brown, faintly green	7.
35	Blend A, No. 1, Bourbon, Louisville, Ky.	0.9462	43.5	Amber	Greatly reduced approximately ½	0.270	Glossy, slightly bitter, caramel-like	0.255	0.015	Brown, scarcely any green tint	4.3
36	Malt, New York	0.9459	44.	Very pale amber	Almost colorless	0.034	Almost odorless and tasteless	0.029	0.005	Pale green, scarcely any precipitate	1.8
37	Rye in bulk, bought from wholesale liquor dealer on druggists's order for whisky, Philadelphia	0.9445	44.5	Deep amber	Decided reduction, approximately ½	0.452	Glossy, spicy, fruity, sweet	0.447	0.005	Scarcely any precipitate and only faint trace of green	2.3
38	Rye whisky, 4 years old, supplied by wholesale druggist on a retailer's order, Philadelphia	0.9395	47.7	Amber	Slight reduction	0.208	Brown, part glossy and part spotted	0.158	0.050	Green-black	11.5
39	P. blend, supplied by wholesale druggist on order of retailer, Philadelphia	0.9410	46.5	Amber	Greatly reduced at least ½	0.482	Glossy, gummy, hygroscopic, fruity	0.477	0.005	Not green, no distinct change	3.8
40	Philadelphia rye whisky, supplied by a wholesale druggist on order of a retailer	0.9437	45.	Amber	Decided reduction, at least 1/3	0.500	Partly, glossy, gummy, faintly woody	0.460	0.040	Greenish brown	14.1

administration as a medicine should have been stored in wood containers for a period of not less than four years before it is used, and should conform to the following characters and tests:

A pale amber-colored liquid, having the odor and taste of diluted alcohol modified by the flavor derived from the grape wine, substances extracted from the wood or naturally formed during the storage, and a slightly acid reaction.

Its specific gravity should not be more than 0.938 nor less than 0.926 at 15.6° C., corresponding, approximately, to an alcoholic strength of 41 to 46 per cent. by weight, or 48 to 54 per cent. by volume of absolute alcohol (see Appendix, Alcohol Tables, page —).

Shake thoroughly 20 Cc. of brandy, 20 Cc. of distilled water and 10 Cc. of ether, allow the mixture to stand until separation has taken place. Separate the ether layer and allow it to evaporate spontaneously on a watch crystal, the residue should not have an unpleasant or irritating odor (excess of *fusel oil*).

Evaporate 100 Cc. of brandy in a tared dish on a water-bath and dry the residue at 100° C. to constant weight; it should weigh not more than 1.5 Gm. Treat this residue with 10 Cc. of distilled water and filter; the solution should give a greenish-black coloration upon the addition of a few drops of diluted ferric chloride T. S. (1 in 10).

100 Cc. of brandy diluted with 200 Cc. of distilled water should require for neutralization not more than 15 Cc. of tenth-normal potassium hydroxide V. S., using phenolphthalein T. S. as indicator (limit of *free acid*).

THE FUTURE OF PHARMACY IN AMERICA.

By C. Ferdinand Nelson, Associate Professor of Physiological Chemistry, University of Kansas, School of Pharmacy.

Progress has always been, and probably always will be, the watchword of and the criterion for healthy advance in all forms of human activity. By means of it we may measure the evolution or decadence of peoples, nations, states, institutions, professions, creeds, or any other of the thousands of forms which our common life assumes. It is the barometer of life, both for the individual and the group, and as such furnishes the data necessary for determining just where the present finds us and in which direction the future points. In the light of this criterion, then, let us examine the *status* *quo* of American pharmacy. Using this as a standard, let us measure our advance to see just where we stand and what the future has in store for us.

It might better serve our purpose, in order to get the matter before us specifically, to ask, and then, if possible, to answer, the following questions: First, has the profession of pharmacy in America made any significant strides forward? Has it kept pace with its sister profession, medicine? If not, then why not? And, secondly, are there any means by which it can attain to what we may truly consider as its own?

When we begin to study the former of these questions soberly and conscientiously one is at the very outset impressed with the extreme complexity as well as the tremendous variability of the factors involved in its solution. And yet this complexity must not deter us. We shall find, upon closer examination, that there appear several legitimate generalizations, whose truth we cannot question and to whose solution we must bend our best efforts.

If the whole question were to be disposed of in a single sentence, most of us would have to answer it in the negative and flatly say, No. Pharmacy in America has not made the progress it should have made, and it has not kept pace with allied professions. Now, Why?

First of all, because the retail drug store in America to-day is a professional anomaly, a business anomaly, a quasi-something, a definite nothing. It has no unity; it does not know its mission; it does not truly serve the public as it should; it divides its attention between business and something that is not business. If it serves at all, it is only in Milton's sense when he says, " They also serve who only stand and wait."

The reasons for this double or multiple life of our drug stores lie largely in fortuitous circumstances that could undoubtedly not be helped; certainly the retail druggist of this generation is not entirely responsible. The retrogression has been slow and unconscious, but in it we find a very good reason why we have not made the progress we should have made.

On the other hand, when we come to examine our progress along educational lines we find, to be sure, evidences of distinct and constant advance. Twenty-five years have seen an increase in preliminary education of from no requirement at all to one year of high school. Again, it must be admitted that State boards of pharmacy are becoming increasingly more exacting, both in the character of the examinations required and in the length of service demanded in order to practise. *But for each advance along these lines we have retrogressed doubly in our actual retail practice.*

To make this point clear, let us inspect the average retail store of to-day. Remove the signs from the windows and over the door; take out the window display, or, if you please, leave that be where it is. You are now quite sure that you are about to enter either a cigar store, an ice-cream parlor, a cafeteria, or a painting or decorating establishment. These are all legitimate and honorable places of business, each eminently proper and necessary, but they are not drug stores. The pharmacist has spent four years of time only to be permitted to do what other people often do far better without any training. No one can be expected to keep actively and adequately interested in such widely-differing fields, and yet the modern druggist is actually making the attempt. The results may easily be anticipated. The druggist easily quotes you the latest prices on sugar, chocolate, white lead, or linseed oil, but not a single item, unless it be advance in price of a drug or chemical, on the recent advances in his avowed calling. In this extreme commercialism we find a second reason why we have not advanced as we should. The blame is not entirely with the retail druggist, but that does not alter conditions in the least.

And now let us look at the inside of the store. What does one find here, time and time again? Look over the list of bottles, tinctures, and saltmouths, and see how absurdly impracticably they are still chosen. Acetanilid comes first, arsenious acid next, both equally important, no regard for their relative toxicity. Then you read Tr. Aconite, Tr. Arnica, not quite as dangerous a combination because both are not used internally, but bad enough. Then probably Tr. Leptandra, Tr. Krameria, Tr. Kino, Cocculus Indicus, Crocus Martis, Po. Cusso, etc., things out of date, never used, but gloriously exhibited. It seems as if some bottle manufacturer made out a list fifty years ago and we still insist on using it, subject only to a few individual preferences.

Run down the list of roots, barks, and pressed herbs and see the splendid museum exhibits going to waste. Go to the fluidextract and pill cases and count the endless relics of the past. The average pharmacist never "cleans house" or prunes his stock. Things are good forever. Why wouldn't it be a splendid idea to develop a "museum department" in our drug stores and every so often add a few aged barks, roots, and pills to the collection? Why not have the American Pharmaceutical Association collaborate with the American Medical Society to get out a volume on "Useless Drugs" as well as "Useful Drugs"? What progress we would make and what comfort it would be to us all! A third reason why we have not progressed is because we have failed to keep pace with the times.

If American pharmacy stands indicted because commercialism has destroyed the unity and essential character of our drug stores, and if we fail miserably to keep abreast of the times and so do not progress as we ought, the pharmacist faces a still graver danger, and endangers his profession by his careless attitude towards the medical profession. Specifically, the pharmacist destroys his own profession in proportion as he fails to keep pace with the physician in his knowledge of drugs and chemicals, when he goes from colleague to mere helper or provider. Our knowledge of drugs and chemicals must be kept up to date, be reliable and specific. We must inform the physician, and not have him inform us. We cannot have the physician tell us what it is our business to be informed on in advance. So long as this state of affairs continues we cannot be said to be adequately progressive.

A very good, if not the very best, index of our scientific progress may be obtained by examining the working libraries of our retail drug stores. What do we find here all too often? A dispensatory and a dozen catalogues of various manufacturing houses. Very seldom can we afford to buy both a dispensatory and a pharmacopœia. If the store has been established since the last dispensatory edition came out, then we are duly up to date in this regard; otherwise we are probably behind the times because a new book costs six-odd dollars. Where are our books on chemistry, bacteriology, pharmacology, materia medica, pharmacognosy, and pharmacy? What real scientific information are we ready to give to the physician and the public? How can we possibly progress when we neglect matters so vital?

And, again, the pharmacist fails to adequately progress because of his attitude towards his legitimate work. Let us compare two young men leaving college, one a pharmacist, the other a physician. Both are young, "green," and equally inexperienced. We may grant that in all respects the conditions of these two men are not parallel, and yet their outlook and desire for advancement along their respective lines ought to be equally great. The young pharmacist becomes the proprietor or manager of a retail store; the physician opens an office. Suppose now that a customer of the former desires to have made a quantitative estimation of sugar in a sample of urine. Chances are at least ten to one that the young pharmacist will tell his customer that he is not equipped to do the work. He has received all the training he needs to do it, but, curiously enough, he will go through some such mental process of reasoning as this: "Now let's see: I didn't do that experiment when I was in college. I haven't any books in which to look up the method. Anyway, I might make a mistake. Moreover, I'm not a chemist, and he had better send it out of town." Oh, the mental deterioration in having things sent away and having somebody else do them for us! A two-dollar book and a burette are all the extra equipment he would need, then a little practice to develop his technic. Now if the problem had been the analysis of a sample of mother's milk, or a well water, or any other problem for which he had received the basal education, although not the specific information required for its solution, he would be positive that it would not do for him to attempt to solve such problems.

Now imagine the young physician being called to see a case. He is sure he has never seen a case of this sort before. But does he say to himself, "I never saw this sort of a case at college; you had better send for some other man"? No; he pitches in, does the best he knows for his patient for the moment, then goes home, reads up on the case, and proceeds to complete the job he was called upon to undertake. By his attitude he has grown mentally; he has become a stronger and better physician; he has been a man of real service to his patient and the community in which he lives. The pharmacist, on the other hand, has weakened mentally, and you can picture him in your mind's eye slowly edging away from his laboratory and gradually moving towards the shelves, counters, and cases that contain the patent medicines, sundries, and cigars.

Now how are we to account for the difference in behavior of these two young men? Who is to blame? Certainly not the individual altogether. We are all to blame. We lack the *esprit de corps* and the confidence we find in the medical profession. A young man enters college imbued with the idea that pharmacy consists in managing a corner drug store as it always has been managed. The university is not strong enough to emancipate him, because too many of our retail pharmacists refuse to give the future of their profession any thought and so lack the necessary vision. Most of our pharmacists take pride in their profession, and wish to see it grow ever bigger and finer, but they do not act concretely and courageously on the problems that confront it. We must keep ourselves from mental stagnation; we must keep alive; we must think, and think hard. The future demands far more than the present, and we must recognize this and act accordingly. We must organize, not primarily to get more business, to keep grocers from selling patent medicines, although we should insist that all patent medicines on the market be sold by the pharmacist, or to get a corner on the beef, iron, and wine and sarsaparilla trade, but for the scientific advancement of our profession which society demands of us if we are not to lose it. Our schools of pharmacy must increasingly take the lead in this movement, because they can naturally give the problems arising the most time and thought, but their efforts to be of any avail must be seconded and pushed along by the conscientious pharmacists over the country.

And now, we may well ask, what specific things must American pharmacy do to come to its own, to resume its place among the professions, to do one thing only and to do that well, to earn the respect and esteem of both the physician and the public at large? A tentative answer falls under the following three separate heads: First, let the pharmacist keep pace educationally with the physician. Let their preliminary trainings be equal. I am fully aware that this cannot be done at once, but it should be the goal towards which we should work. Secondly, make the professional or technical equipment of the pharmacist as broad as that of the physician, although of a different character. The pharmacist should have a broad and thorough training, first of all, in pharmacy, but also in physiology and experimental pharmacology. He should be especially well grounded in chemistry and bacteriology, so as to be in a position to advise and collaborate with the physician and public health officials in diagnostic and municipal problems requiring chemical and bacteriological technic for their solution. Then and only then can he hope to become the physician's colleague and with him serve society truly for the prevention and elimination of disease. Third, schools of pharmacy must in the future be as courageous as most schools of medicine are at present (Many of our medical schools have recently reduced the numbers in their classes from hundreds to tens.) To fill the demands of the commercial market for retail drug clerks must not be their aim, and in this endeavor they should be supported by the retail pharmacist who has his profession at heart. They must concentrate their energies on producing a few highly-trained pharmacists. All honor be to the men and to the schools of pharmacy who are to-day insisting on greater preliminary training as well as more thorough and longer professional preparation. They may be working a hardship on the profession for the moment, but in the long run it is bound to result in good for both the pharmacist and the public at large.

SOME RELATIONS OF PLANTS TO DISTILLED WATER AND CERTAIN DILUTE TOXIC SOLUTIONS.*

By M. C. Merrill.

(Continued from p. 22, January, 1916.)

After 40 days in distilled water, whether renewed or unrenewed, the recovery was almost nil, though somewhat better in the renewed, while after 50 days in either renewed or unrenewed distilled water all the cultures were dead.

In the 10 cases furnishing comparisons between cultures in which the full nutrient solution was preceded on the one hand by renewed and on the other by unrenewed distilled water, greater growth was attained in 7 cases where the distilled water was renewed. The total weight of green tops is more nearly equal in the two sets of cultures, however, being 24.20 grams in the case of those in the unrenewed and 22.38 grams in the case of those in the renewed distilled water. We thus see that no injurious effects attend the renewal of the distilled water when compared with the non-renewal of the same; on the other hand, positive benefits are derived from such a renewal, especially in the case of plants approaching the maximum time limit of durability in distilled water—a period which enables the results of the two conditions to be more readily seen and compared.

In pl. 15 fig. 1 some of the cultures are illustrated, the ones of special interest being Nos. 9–14. The exceptionally small or irregular growth of No. 8 is difficult to account for, because in the renewed full nutrient it should be greater than that of No. 7. Individual resistance is apparent, however.

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* Reprinted from *Annals of the Missouri Botanical Garden*, vol. 2, No. 3, pp. 459–498.

V. RECOVERY OF PLANTS AFTER BEING IN TOXIC SOLUTIONS.

Having thus ascertained the maximum time plants may remain in distilled water and then recover on being placed in full nutrient solution, we may turn our attention to toxic solutions. If distilled water in itself is toxic then it should be interesting to get quantitative data on its effects as measured by the power of plants so treated to recover. This power should furnish a good index regarding the extent of any injury suffered. By comparing the ultimate time limits for various media after which recovery in full nutrient solution is possible we are able to get a basis on which to determine the relative toxicity of each medium. Almost simultaneously with series 3, series 4 was set up. The plan of the series and the green weight of tops and dry weight of roots of the plants in series 4 are given in Table VI, while pl. 15 fig. 2 shows the actual condition of the plants in some of the media. The results obtained indicate the following relative toxicities of the substances used, the time expressed in days having reference to the longest period in the toxic solution after which recovery is possible:

Redistilled water	30–40 days
N/100 $MgCl_2$	4–8 days
N/1000 $MgCl_2$	about 20 days
N/1000 $CaCl_2$ and N/20 $MgCl_2$	about 16 days
N/12800 H_2SO_4	about 20 days
N/400 KOH	about 20 days

We thus see that as compared with the toxic solutions mentioned distilled water, if it be considered as a toxic agent at all, is much less so than either of the others given above. In this connection it is interesting to note that Kahlenberg and True ('96) found that N/12800 H_2SO_4 and N/400 KOH were approximately the critical concentrations for Lupinus roots. Hence, the fact that plants can remain much longer in distilled water than in these solutions and still recover would seem to indicate that as regards toxicity distilled water is only very slightly if at all deleterious. But the writer believes that it is entirely incorrect and misleading to speak of distilled water as being toxic. What is illustrated above for distilled water is not toxicity, therefore, but merely the length of time plants can survive in a medium without nutrient materials. That these plants could not survive for that length of time in the other media, however, shows that in those cases a real toxicity enters into consideration.

TABLE VI (Series 4).

Effect on Growth of Plants of Various Periods in Toxic Solutions.

Culture number	First solution or medium	Length of period in first medium days	First medium renewed or unrenewed	Length of period in full nutrient days	Green weight of tops grams	Dry weight of roots grams
1	Dist. H_2O	32	Unrenewed	..	1.15	.116
2	Dist. H_2O	32	Renewed	..	1.55	.130
3	N/100 $MgCl_2$	32	Unrenewed	..	.35	.012
4	N/100 $MgCl_2$	32	Renewed	..	.40	.016
5	N/100 $MgCl_2$	1	Unrenewed	31	10.15	.428
6	N/100 $MgCl_2$	2	Unrenewed	30	8.40	.372
7	N/100 $MgCl_2$	4	Unrenewed	28	5.15	.132
8	N/100 $MgCl_2$	8	Unrenewed	24	.35	.018
9	N/100 $MgCl_2$	12	Unrenewed	20	.30	.020
10	N/100 $MgCl_2$	16	Unrenewed	16	.40	.016
11	N/100 $MgCl_2$	20	Unrenewed	12	.28	.012
12	N/1000 $MgCl_2$	32	Unrenewed	..	1.00	.085
13	N/1000 $MgCl_2$	32	Renewed	..	1.00	.038
14	N/1000 $MgCl_2$	2	Unrenewed	30	8.85	.385
15	N/1000 $MgCl_2$	4	Unrenewed	28	9.70	.384
16	N/1000 $MgCl_2$	8	Unrenewed	24	7.20	.305
17	N/1000 $MgCl_2$	12	Unrenewed	20	5.15	.192
18	N/1000 $MgCl_2$	16	Unrenewed	16	2.05	.121
19	N/1000 $MgCl_2$	20	Unrenewed	12	1.05	.093
20	N/1000 $CaCl_2$ and N/20 $MgCl_2$	32	Unrenewed	..	.75	.092
21	N/1000 $CaCl_2$ and N/20 $MgCl_2$	32	Renewed	..	.85	.099
22	N/1000 $CaCl_2$ and N/20 $MgCl_2$	1	Unrenewed	31	10.60	.409
23	N/1000 $CaCl_2$ and N/20 $MgCl_2$	2	Unrenewed	30	9.35	.388
24	N/1000 $CaCl_2$ and N/20 $MgCl_2$	4	Unrenewed	28	10.35	.384
25	N/1000 $CaCl_2$ and N/20 $MgCl_2$	8	Unrenewed	24	8.40	.294
26	N/1000 $CaCl_2$ and N/20 $MgCl_2$	12	Unrenewed	20	3.00	.144
27	N/1000 $CaCl_2$ and N/20 $MgCl_2$	16	Unrenewed	16	1.50	.117
28	N/1000 $CaCl_2$ and N/20 $MgCl_2$	20	Unrenewed	12	.75	.103
29	Full nutr. sol'n.	32	Unrenewed	32	8.95	.411
30	Full nutr. sol'n.	32	Renewed	32	18.50	.530
31	N/12800 H_2SO_4	32	Unrenewed	..	1.55	.130
32	N/12800 H_2SO_4	32	Renewed	..	1.25	.124
33	N/12800 H_2SO_4	2	Unrenewed	30	7.05	.318
34	N/12800 H_2SO_4	8	Unrenewed	24	7.45	.289
35	N/12800 H_2SO_4	16	Unrenewed	16	4.40	.236
36	N/12800 H_2SO_4	20	Unrenewed	12	1.95	.172
37	N/400 KOH	32	Unrenewed	..	1.25	.094
38	N/400 KOH	32	Renewed	..	1.50	.108
39	N/400 KOH	2	Unrenewed	30	8.60	.444
40	N/400 KOH	8	Unrenewed	24	6.60	.214
41	N/400 KOH	16	Unrenewed	16	2.55	.092
42	N/400 KOH	20	Unrenewed	12	2.60	.117

In addition to the actual time limits for recovery just tabulated, as well as the method of recovery and delayed maturity mentioned in the preceding section, another interesting point, which was very noticeable in the cultures and which can also be seen in the plates, is the character of growth of the rootlets in the boundary cultures, by which is meant those cultures which have remained in the inimical media nearly as long as their endurance would permit, and whose recovery in full nutrient solution is slower or more difficult than the normal unaffected plants. In the latter case the roots are short and compact and usually extend down only to about one-half the distance to the bottom of the tumbler. In the case of the first mentioned cultures, however, when transferred to full nutrient solution the rootlets develop a long, slender growth easily extending to the bottom of the tumbler.

VI. EFFECT OF STERILIZING THE WATER DURING GROWTH OF PLANTS

The foregoing series pointed, therefore, to factors other than extraction or loss of solute from the plant tissue as being responsible for the deteriorating phenomenon observed when growing plants are placed in distilled water. In the unrenewed water cultures in the previous series a brownish coloration developed and the roots appeared, in their gelatinized condition, to be covered by bacterial and fungous growths. Suspecting that these organisms played an important rôle, it was decided to grow additional cultures to test this point. Four cultures, each containing ten plants of *Pisum sativum,* were set up in distilled water: in one the medium was not renewed; in a second the water was renewed every four days; and in the remaining two the medium was sterilized every four days by boiling in a return condenser one-half hour. The results are given in Table VII (series 5) and the cultures are shown in pl. 16 fig. 1. The full nutrient solution cultures were grown for purposes of comparison. The duration of growth was 30 days.

TABLE VII (Series 5).

Effect Produced on Growth of Plants by Sterilizing the Water in which they are Grown.

Culture number	Medium	Condition of medium	Green weight of tops, grams	Dry weight of roots, grams
1	Dist. H_2O	Unrenewed	1.55	.141
2	Dist. H_2O	Renewed	1.65	.150
3	Dist. H_2O	Sterilized	2.40	.225
4	Dist. H_2O	Sterilized	3.05	.233
5	Full nutr.	Unrenewed	10.30	.342
6	Full nutr.	Renewed	17.65	.507

Whether the beneficial effect of the sterilization was due to the destruction of the bacterial and fungous floras of the medium, to a decomposition of any contained toxic substances (thereby rendering them less toxic), or to incidental effects such as aëration of the water by the boiling process, was not definitely determined. Neither was this effect compared with that produced by the addition of various bodies (tannic acid, pyrogallol, calcium carbonate, various hydrates, carbon black, and other substances mentioned by Livingston and his co-workers, '05, '07; Dachnowski, '08, '09, and others). In the last paper of Livingston and his co-workers referred to are given the results of boiling the aqueous extracts from soils containing toxic properties as determined by the growth of plants in the same. The boiling improved the extracts, but this effect was explained by "supposing the process of boiling to remove or change the toxic action of this extract, the toxic materials being perhaps partly volatile with steam." But since in our sterilization process a return condenser was used the removal of toxic substances by volatilization would not occur. A breaking down of toxic compounds into less toxic constituents may possibly be a condition induced by the boiling, however. It will be recalled that Lyon ('04) found the toxicity of tap water reduced by boiling.

While the oxidizing power of roots, due to enzymatic activity, may be an important factor in aiding in the decomposition of vegetable matter in the soil, as pointed out by Schreiner and Reed ('07) and others, it is not believed that in the case under consideration the oxidizing power of the roots was altered to any appreciable degree by the boiling of the medium. Dachnowski ('12) mentions the effect of oxidation upon the toxic substances found in bog water. In the sterilization method by boiling under a return condenser, however, the aëration or oxidation phenomenon would no doubt play only a subsidiary rôle. The stronger line of evidence seems to favor the destruction of injurious bacterial and fungous agencies as the chief factor in the beneficial effect of the sterilization.

VII. Conductivity Measurements.

The excellence of the electrical conductivity method for determining any change in the electrolyte content of an aqueous medium naturally led to its adoption for the experimental work described below. This phase of the investigation was especially concerned with determinations pertaining to the extraction of electrolytes—including the essential nutrient salts—from the roots of plants in distilled water. The generally beneficial results attendant upon a frequent renewal of the distilled water in which the plants were placed has already been noted, as well as the evidence in favor of the view that conditions other than extraction of essential salts constitute the underlying cause of the deterioration of plants in distilled water.

The next point to be determined was the relative amount of the total exosmosis in the renewed distilled water as compared with that in the unrenewed. In placing roots in distilled water it is pertinent to this subject to inquire whether all the exosmosis occurs during the first four days. If it does, we should have the same amount of extraction in both the unrenewed water and that renewed every four days. Or is there a renewal of the exosmosis of the electrolytes following the renewal of the water each time, thereby giving rise to a greater exosmosis than in the cultures in which the water was not renewed? If such a condition obtains and yet in spite of it the renewal of the water shows no baneful effects, or indeed produces beneficial results, then may we well conclude, and with increasing assurance, that extraction of nutrient salts is in no way responsible for any injury plants undergo in distilled water. The results obtained strongly substantiate that conclusion.

A series of cultures (series 6) was set up in which healthy plants of Canada field peas were grown in full nutrient solution for about three weeks and then transferred, after carefully rinsing the roots, to doubly distilled water. In half of the cultures the distilled water was renewed at certain definite intervals for each culture, while in the other half of the cultures the water was not renewed. Conductivity determinations were then made of the water under both conditions—renewal and non-renewal—at certain regular intervals, varying for each set of cultures, for several days after the plants had been placed in this medium.

By numerous readings it was ascertained that with a resistance of 9110 ohms in the resistance box the average value of x on the Wheatstone bridge for the water in the vessel after being rinsed and before placing the roots therein was approximately 6.0, rarely varying 1 cm. either way. Considering that figure, then, as the basis or the starting point for the exosmosis, and subtracting it from the different values found for the renewed, and from only the final value obtained for the unrenewed distilled water, we get the figures in the last column of Table VIII.

TABLE VIII (Series 6).

Comparative Exosmosis in Renewed and Unrenewed Distilled Water.

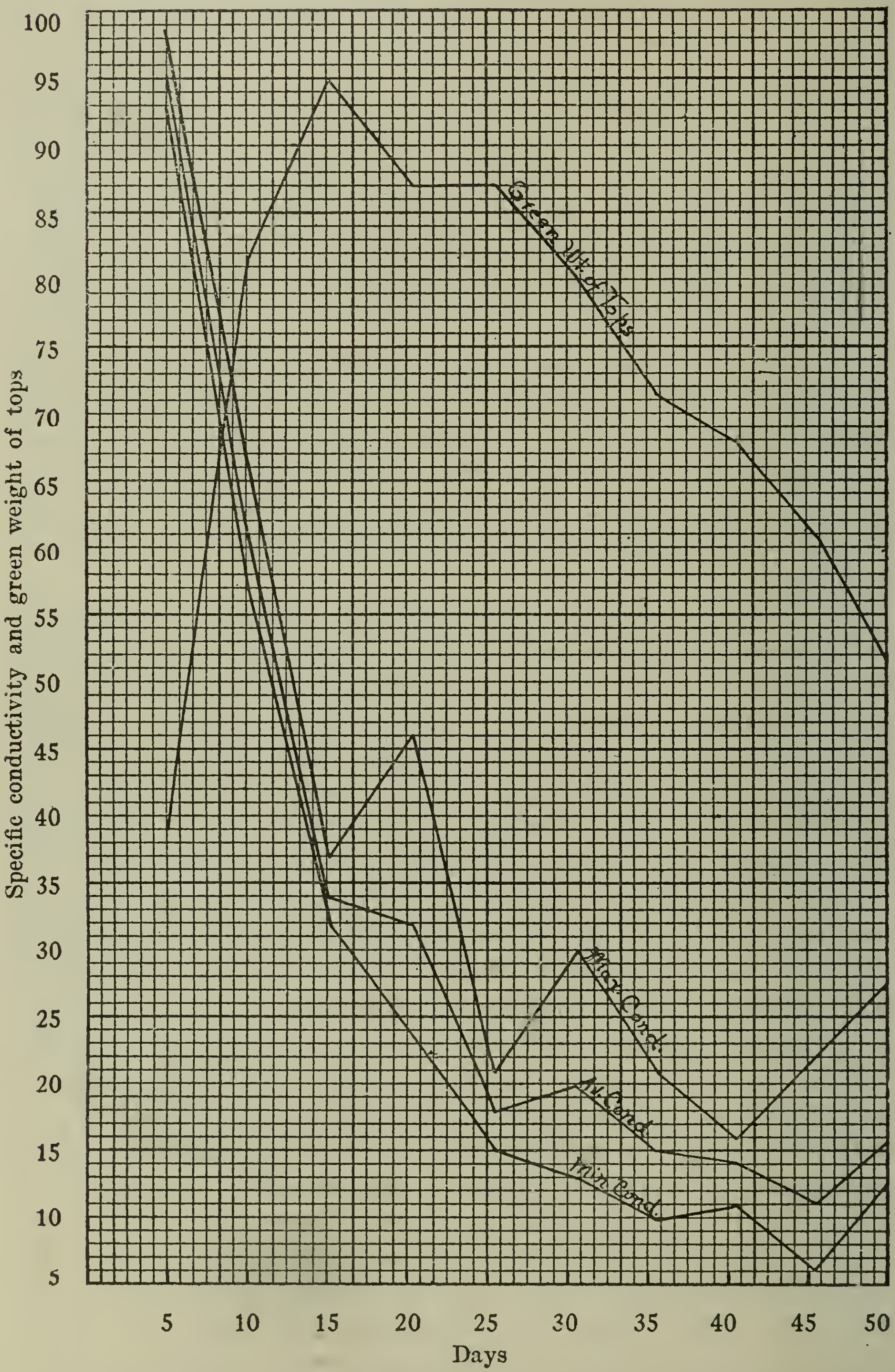
Culture No.	Water renewal	Conductivity readings								Duration of treatment, days	Total increase in conductivity
		Frequency	1st	2nd	3rd	4th	5th	6th	7th		
1	Every day	Every day	32.9	10.4	10.0	8.9	9.7	9.4	10.2	7	49.5
2	None	Every day	36.3	22.8	21.4	17.8	15.2	12.5	11.4	7	5.4
3	Every 2 days	Every 2 days	10.8	9.3	9.6	10.7	...	...	...	8	16.4
4	None	Every 2 days	25.0	14.3	13.6	11.0	...	...	...	8	5.0
5	Every 4 days	Every 4 days	12.9	15.0	16.1	16.1	...	...	...	16	36.1
6	None	Every 4 days	10.7	12.4	15.9	19.5	...	...	...	16	13.5

The plan of the experiment with respect to renewal of the distilled water and the time of readings, the values of the individual readings, and the comparative amounts which represent the total exosmosis of the electrolytes under the various conditions of the experiment are all given in Table VIII. The numbers given are the values of x on the Wheatstone bridge when the resistance inserted in the box was 9110 ohms.

It is thus seen that by far the greater exosmosis was obtained in the case of those cultures in which the distilled water was renewed. Another point of interest was the reabsorption of electrolytes—as seen by the decrease in conductivity of the medium—in those cultures in which the distilled water was not renewed. The reabsorption of electrolytes has been observed to be a phenomenon characteristic of normal, healthy peas, when transferred from a full nutrient solution to distilled water, after being in the latter medium one or two days.

In order to obtain some additional information regarding the relations between the conductivity of the medium and the plants grown therein, series 7 containing 50 cultures was set up in full nutrient solution, ten Canada field pea plants to each culture. The nutrient solution was not renewed. At the end of each five-day period 5 of the cultures were taken down, the green weight of tops of the plants in each determined, and the conductivity of the solution measured; and from these results the average green weight of tops and the average conductivity of each set of 5 cultures were obtained. This was done throughout the entire period of 50 days. The results obtained are given in Table IX and plotted as curves in fig. 1. In the latter the abscissa represents days, and the ordinate both specific conductivity and green weight of tops. The values given for conductivity should be multiplied by 10^{-5} in order to get the specific conductivity values.

FIG. I.



The conductivity and growth curves for the full nutrient solution (Pfeffer's) in which plants were grown 50 days, the medium being unrenewed. (For complete explanation see the text.)

In the case of the weights the numbers in the margin represent ten times the actual weight in grams, *e.g.*, 40 in the margin = 4.0 grams.

TABLE IX (Series 7).

Growth of Plants and Conductivity of Full Nutrient Medium for 50 Days.

Cultures numbers	Length of period in full nutrient days	Average green weight of tops in each culture, grams	Specific conductivity * at end of period		
			Minimum	Average	Maximum
1– 5	5	3.81	93.22	96.25	98.19
6–10	10	8.12	57.47	61.03	66.93
11–15	15	9.47	32.38	34.83	37.59
16–20	20	8.66	24.38	32.68	46.05
21–25	25	8.69	15.73	18.19	21.69
26–30	30	8.00	13.74	20.63	30.28
31–35	35	7.10	10.02	15.98	21.23
36–40	40	6.77	11.16	14.23	16.19
41–45	46	6.09	6.88	11.44	22.51
46–50	50	5.01	13.00	16.97	28.11

* The numbers in the three columns are to be multiplied by 10^{-5} in order to arrive at the specific conductivity values.

From the results it is seen that both the increase in green weight of tops and decrease in conductivity of the medium are most rapid and pronounced during the first 15 days. After that period both the green weight and the conductivity gradually decline, but the latter more slowly than the former. While the curves of the minimum, average, and maximum conductivity remain very close together during the first 15 days, they become more divergent after that time. The green-weight curve shows a gradual decline as the age of the plant in-

TABLE X (Series 8).

Growth of Plants and Conductivity of Distilled Water Medium for 50 Days.

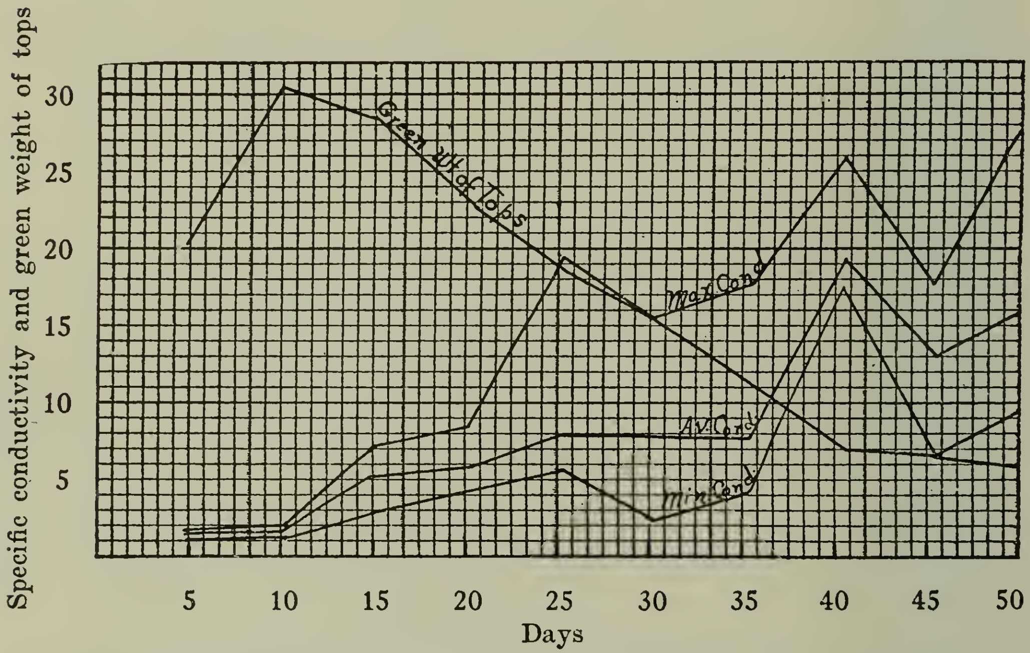
Cultures numbers	Length of period in distilled water, days	Average green weight of tops, grams	Specific conductivity * at end of period		
			Minimum	Average	Maximum
1– 5	5	2.04	1.46	1.54	1.66
6–10	10	3.07	1.01	1.34	1.81
11–15	15	2.89	3.04	5.43	7.41
16–20	20	2.34	4.34	5.92	8.63
21–25	25	1.89	5.66	8.15	19.77
26–30	30	1.55	2.60	8.26	15.82
31–35	35	1.15	4.43	7.80	17.95
36–40	40	.72	17.62	19.51	26.04
41–45	45	.68	6.87	13.32	17.95
46–50	50	.60	10.51	16.48	29.00

* The numbers in the three columns are to be multiplied by 10^{-5} in order to arrive at the specific conductivity values.

creases, after a certain period, due to the drying of the tops and consequent loss of water. Different curves would, of course, have been obtained had the nutrient solution been renewed.

In Table X and fig. 2 are seen the results of series 8, a similar experiment with distilled water, the same units being used as in the previous case The green weight of tops increased during the first 10 days and then gradually declined to the end of the experiment. The conductivity of the water was practically the same on the 10th as it had been on the 5th day. Evidence from other experiments, however, indicates that in the interim the curve might have risen and fallen. After the 10th day the curve inclined with fluctuations. Here again are seen evidences that the 10-day period for seedlings in the distilled water may properly be considered a crucial one for the plants. After that time the growth declines and the conductivity increases markedly.

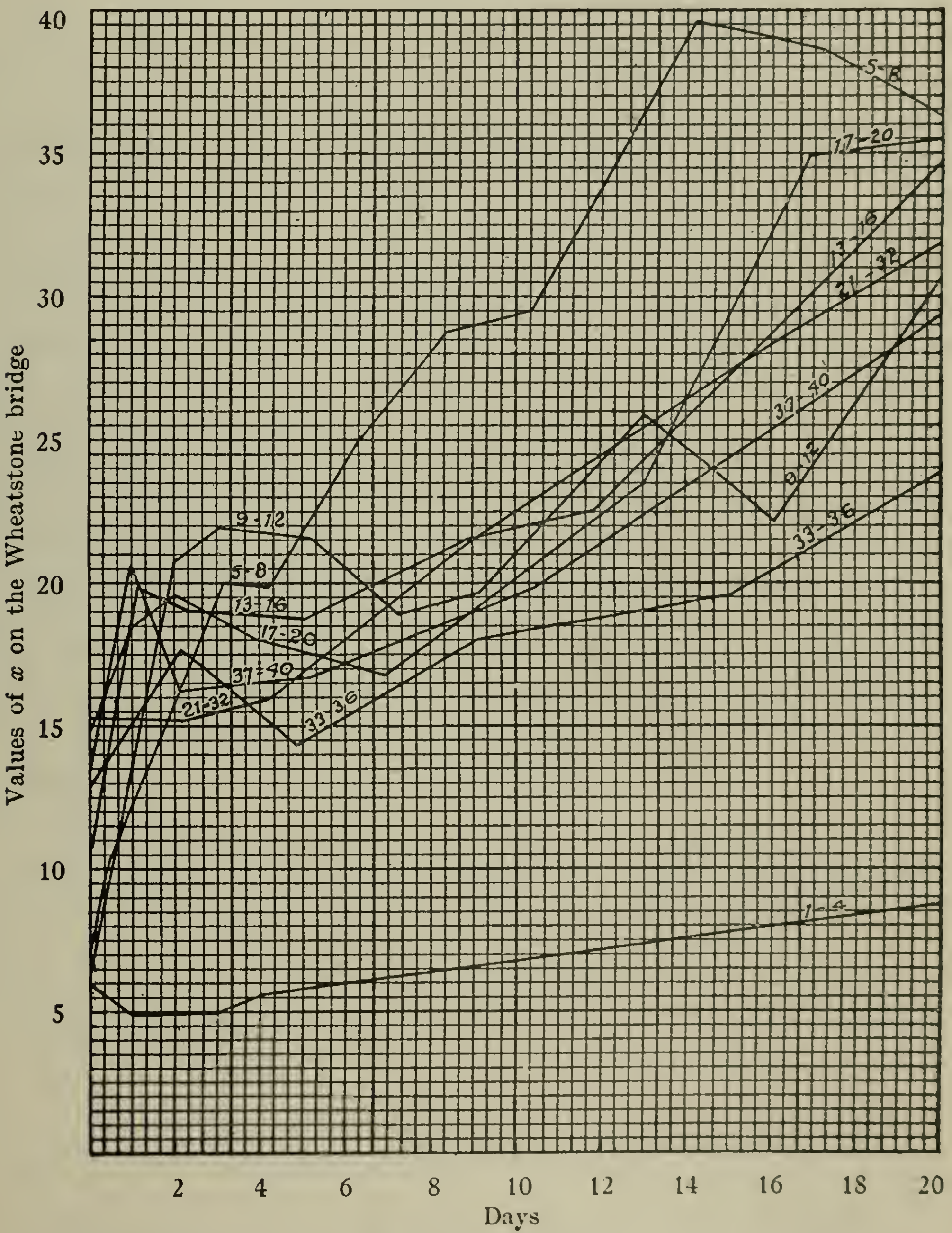
Fig. 2.



The conductivity and growth curves for the unrenewed redistilled water in which pea seedlings were grown for 50 days. (For complete explanation see the text.)

Suspecting that the question of injury to plants in distilled water might be intimately bound up with that of lack of reserve food materials, the writer carried out an experiment bearing upon this matter. The experiment consisted, first, in placing some Canada field pea seedlings directly into redistilled water and determining the specific conductivity of the water at intervals for 20 days; and, next, in transferring some pea plants which had been grown in full nutrient solution for 1, 5, 10, 20, 30, and 40 days, respectively, to redistilled water, and determining the specific conductivity of the water at intervals for 20 days. The results are plotted as curves in

FIG. 3.



The conductivity curves for cultures in distilled water 20 days—after growth in full nutrient solution for varying periods of time, as follows: Nos. 9–12, 1 day; Nos. 13–16, 5 days; Nos. 17–20, 10 days; Nos. 21–32, 20 days; Nos. 33–36, 30 days; Nos. 37–40, 40 days. Nos. 5–8 were grown only in distilled water, while Nos. 1–4 were without plants, consisting only of distilled water.

fig. 3, the conductivity values being represented in terms of x on the Wheatstone bridge with a resistance of 9110 ohms in the box. Four cultures of 10 plants each (except in the case of the 20-day period in full nutrient solution in which 12 cultures were used) were grown under each of the specified conditions, and the curves represent the averages for the 4 (or 12) cultures under each condition. To determine how much increase in conductivity was contributed by the glass tumblers in which the cultures were grown, 4 such containers filled only with redistilled water, and containing no plants, were used and the conductivity of the water determined at intervals for 20 days. It is seen that from the seedlings which had not been in full nutrient solution at all (Nos. 5–8) the highest conductivity resulted, while from those which were in the full nutrient solution longest before being placed in the distilled water (Nos. 37–40 and 33–36) the lowest conductivity was found at the end of 20 days. The other cultures at the end of 20 days were midway between the two extremes. It is also seen that, whereas the conductivity curve for Nos. 5–8 shows very little tendency to decline in the early stages, the curves for the cultures which had first been in full nutrient solution show that tendency to a considerable extent. And that tendency, as we have previously remarked, is a characteristic feature of normal plants transferred from full nutrient solution to distilled water.

Attention should be called to the difference in the character of the conductivity curves in fig. 2 and that of 5–8 in fig. 3.

(*To be continued.*)

ANNUAL REPORT OF THE INTERNATIONAL COMMITTEE ON ATOMIC WEIGHTS, 1916.*

Although many scientific activities have been interrupted by the European war, a fair number of atomic-weight determinations have appeared since the report for 1915 was prepared. They are, briefly, as follows:

Carbon.—Richards and Hoover[1] neutralized sodium carbonate with hydrobromic acid which had been standardized against silver.

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* Reprinted from the *Journal of the American Chemical Society*, vol. xxxvii, No. 11, November, 1915, p. 2449.

[1] *Jour. Amer. Chem. Soc.*, 37, 95.

In this way the ratio of carbonate to silver was determined. With Ag = 107.88, Br = 79.916, and Na = 22.995, C = 12.005.

Sulfur.—Atomic weight also determined by Richards and Hoover,[2] who measured the ratio between sodium carbonate and sulphate. With the values previously assigned to sodium and carbon, S = 32.060.

Iodine.—By the direct analysis of iodine pentoxide, Guichard[3] finds I = 126.92.

Copper.—The electrolytic ratio between copper and silver has been remeasured by Shrimpton,[4] with Ag = 107.88, Cu = 63.563, as the mean of ten determinations.

Nickel.—Oechsner de Coninck and Gerard,[5] by reduction of nickel oxalate in hydrogen, find Ni = 58.57. Few details are given.

Cadmium.—By the electrolysis of cadmium chloride Baxter and Hartmann[6] find Cd = 112.417. This confirms the earlier work of Baxter and his colleagues, and gives cadmium a much higher value than was found by Hulett.

Mercury.—By the synthesis of mercuric bromide Baker and Watson[7] find Hg = 200.57, when Br = 79.92. This value is near that found by Easley.

Lead.—By the analysis of lead bromide Baxter and Thorvaldsen[8] find Pb = 207.19. With the chloride, Baxter and Grover[9] obtained the value 207.21, and with the bromide, 207.19. These determinations were made with *normal* lead from widely-separated and dissimilar sources, and are highly concordant.

The value Pb = 207.20 will be adopted in the table of atomic weights.

Lead from radioactive minerals, however, has been found to differ in atomic weight from ordinary lead. For lead from thorite Soddy and Hyman[10] found atomic weights ranging from 208.3 to 208.5. Maurice Curie[11] studied lead from pitchblende, carnotite, and

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[2] *Jour Amer. Chem. Soc.*, 37, 108.

[3] *Compt. rend.*, 159, 185.

[4] *Proc. Phys. Soc. London*, 26, 292.

[5] *Compt. rend.*, 158, 1345.

[6] *Jour. Amer. Chem. Soc.*, 37, 113.

[7] *J. Chem. Soc.*, 107, 63.

[8] *Jour. Amer. Chem. Soc.*, 37, 1021.

[9] *Ibid.*, 37, 1027.

[10] *J. Chem. Soc.*, 105, 1402.

[11] *Compt. rend.*, 158, 1676.

INTERNATIONAL ATOMIC WEIGHTS, 1916.

	Symbol	Atomic weight
Aluminum	Al	27.1
Antimony	Sb	120.2
Argon	A	39.88
Arsenic	As	74.96
Barium	Ba	137.37
Bismuth	Bi	208.0
Boron	B	11.0
Bromine	Br	79.92
Cadmium	Cd	112.40
Caesium	Cs	132.81
Calcium	Ca	40.07
Carbon	C	12.005
Cerium	Ce	140.25
Chlorine	Cl	35.46
Chromium	Cr	52.0
Cobalt	Co	58.97
Columbium	Cb	93.5
Copper	Cu	63.57
Dysprosium	Dy	162.5
Erbium	Er	167.7
Europium	Eu	152.0
Fluorine	F	19.0
Gadolinium	Gd	157.3
Gallium	Ga	69.9
Germanium	Ge	72.5
Glucinum	Gl	9.1
Gold	Au	197.2
Helium	He	4.00
Holmium	Ho	163.5
Hydrogen	H	1.008
Indium	In	114.8
Iodine	I	126.92
Iridium	Ir	193.1
Iron	Fe	55.84
Krypton	Kr	82.92
Lanthanum	La	139.0
Lead	Pb	207.20
Lithium	Li	6.94
Lutecium	Lu	175.0
Magnesium	Mg	24.32
Manganese	Mn	54.93
Mercury	Hg	200.6
Molybdenum	Mo	96.0
Neodymium	Nd	144.3
Neon	Ne	20.2
Nickel	Ni	58.68
Niton (radium emanation)	Nt	222.4
Nitrogen	N	14.01
Osmium	Os	190.9
Oxygen	O	16.00
Palladium	Pd	106.7
Phosphorus	P	31.04
Platinum	Pt	195.2
Potassium	K	39.10
Praseodymium	Pr	140.9
Radium	Ra	226.0
Rhodium	Rh	102.9
Rubidium	Rb	85.45
Ruthenium	Ru	101.7
Samarium	Sa	150.4
Scandium	Sc	44.1
Selenium	Se	79.2
Silicon	Si	28.3
Silver	Ag	107.88
Sodium	Na	23.00
Strontium	Sr	87.63
Sulfur	S	32.06
Tantalum	Ta	181.5
Tellurium	Te	127.5
Terbium	Tb	159.2
Thallium	Tl	204.0
Thorium	Th	232.4
Thulium	Tm	168.5
Tin	Sn	118.7
Titanium	Ti	48.1
Tungsten	W	184.0
Uranium	U	238.2
Vanadium	V	51.0
Xenon	Xe	130.2
Ytterbium (Neoytterbium)	Yb	173.5
Yttrium	Yt	88.7
Zinc	Zn	65.37
Zirconium	Zr	90.6

yttrotantalite, and obtained values from 206.36 to 206.64. Lead from monazite and galena was more nearly normal. Hönigschmid and Horowitz[12] studied lead from pitchblende, and by analyses of the chloride found Pb = 206.735. Richards and Lembert[13] made six series of analyses of lead chloride prepared with lead derived from carnotite, thorianite, pitchblende, and uraninite, the mean values being Pb = 206.59, 206.81, 206.83, 206.57, 206.86, and 206.36. These figures, although each series is concordant within itself, show that radio lead is variable in its atomic weight, and that the single, definite metal is yet to be completely isolated. Indeed, the relations between radio lead (or leads) and ordinary lead are still obscure.

Tin.—Briscoe,[14] by analyses of the tetrachloride $SnCl_4$ finds Sn = 118.70, when Ag = 107.88 and Cl = 35.457. This new value, which was determined with all modern precautions, will be adopted in the table.

Tantalum.—Sears and Blake,[15] in a preliminary series of determinations of the ratio between $TaCl_5$ and Ag, obtained values for Ta ranging between 180.90 and 182.14. The research is to be continued.

Praseodymium.—Baxter and Stewart,[16] in a long series of concordant analyses of the chloride $PrCl_3$, find Pr = 140.92. The rounded-off figure 140.9 will be adopted here.

Ytterbium.—Blumefeld and Urbain,[17] in a series of analyses of the sulphate $Yb_2(SO_4)_3.8H_2O$, find Yb = 173.54. This may be rounded off to 173.5.

Uranium.—Hönigschmid,[18] from analyses of the bromide UBr_4, finds U = 238.18. The value 238.2 may properly be adopted.

At the meeting of the International Congress of Applied Chemistry, in 1912, a resolution was passed favoring delay in changes in the table of atomic weights. In accordance with the desire so expressed, no changes have since been made, but several now seem to be necessary. These relate to C, S, He, Sn, Pb, Ra, U, Yt, Pr, Yb, Lu, and U. The reasons for the changes, which are small, may be found in this and the three preceding reports. They are based upon new determinations, which seem to be better than the old.

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[12] *Z. Electrochem.*, 20, 457.

[13] *Jour. Amer. Chem. Soc.*, 36, 1329.

[14] *J. Chem. Soc.*, 107, 63.

[15] *Jour. Amer. Chem. Soc.*, 37, 839.

[16] *Ibid.*, 37, 516.

(Signed) F. W. Clarke,
T. E. Thorpe,
W. Ostwald.

Note.—Professor Urbain, because of an official connection with the military service of France, is debarred from signing any international report during the war. Otherwise he would approve this report. F. W. C.

CORRESPONDENCE.

Procter Memorial.

At the meeting of the American Pharmaceutical Association in 1913 the Committee on the William Procter, Jr., Monument Fund reported that it had collected the necessary funds for the erection of a monument in accordance with the preamble and resolutions adopted by the Association at its annual meeting in Kansas City in 1904. The committee was instructed to take preliminary steps and make arrangements for space and the erection of the monument in the Smithsonian ground at Washington, D. C., by the time of the centennial of the birth of William Procter, Jr., the Father of American Pharmacy, in 1917. A model has been submitted by a sculptor of repute and a bill has been introduced in Congress by the Hon. J. Charles Linthicum, of Maryland, to provide for the erection of a pedestal and a base for the statue in the Smithsonian grounds at Washington, D. C. The bill, known as H. R. 8932, reads as follows:

"A BILL

"To provide for the erection of a pedestal and base for a monument to William Procter, junior, in the Smithsonian grounds, at Washington, District of Columbia.

"*Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,* That the sum of $2000, or so much thereof as may be necessary, is hereby appropriated, out of any money in the Treasury not otherwise appropriated, for the erection in the Smithsonian grounds, in the city of Washington, District of Columbia, under the direction of the Secretary of War, of a pedestal and base for a monument in memory of William Procter, junior.

"In the preparation of the plans and the selection of a site for said monument and the execution of all work in connection therewith the Secretary of War shall form a committee, with whom he may confer, composed of Doctor John F. Hancock, Doctor Charles Caspari, junior, James E. Hancock, and Parker Cook, comprising the William Procter, junior, monument fund committee of the American Pharmaceutical Association, and two other persons to be designated by the Secretary of War: *Provided, however,* That the decision of the Secretary of War shall be final in all matters connected with this work: *Provided further,* That the said monument, pedestal, and base shall not be erected until the design and site selected therefor shall have been approved by the Commission of Fine Arts: *And provided further,* That the money herein appropriated shall be drawn from the Treasury and disbursed as needed, in the progress of the work, by the Secretary of War or his duly appointed representative."

HENRY T. HELMBOLD.

Editor of the AMERICAN JOURNAL OF PHARMACY:

I have read with much interest the article published on Helmbold, "The Buchu King." I remember quite well his splendid coach with its "four-in-hand" team, their harness resplendent with gold plate, and the scarlet-coated footmen. One of the things which impressed me at the time that Helmbold's preparations were the "best sellers" was the liberality with which the striking gold signs were distributed.

These signs were triangular in shape, about three feet on a side, with gold leaf most liberally displayed upon them. The picture upon them represented the gathering of Helmbold's buchu by the natives in South Africa; a lot of Hottentots were pictured as cutting down large quantities of monocotyledonous plants resembling rushes. To those who knew the botanical characters of buchu the sign was ridiculous, for buchu is a dicotyledonous shrub, with ovate leaves less than an inch in length. I suppose, however, that in most cases it exemplified the saying, "Where ignorance is bliss, 'tis folly to be wise"; but what of Helmbold's botanical knowledge?

The doctor, or some one in his employ, well understood what the character of a good preparation of buchu should be like, and that alcohol is contra-indicated in kidney troubles, therefore, the alcoholic strength of the preparation was made as low as possible. The preparation was remarkably efficient, and, owing to its efficiency and remarkable advertising, had a phenomenal sale.

A reference to Dr. Jayne recalled to my mind that I have frequently heard a great aunt of mine, who resided at one time in Woodstown, N. J., speak of Dr. Jayne's father. He occasionally stopped to get a meal, and, as he was very poor, his costume was simplicity itself, consisting of a tow shirt, pair of pants suspended by one "gallus," and a straw hat, *sans* stockings, *sans* shoes. His son (Dr. Jayne), who was a young man of remarkable push and energy, came to Philadelphia and by means of a small amount of borrowed capital amassed a great fortune. I have been told that some time in the early sixties he had his almanac translated into Chinese and circulated in that country. A few months afterwards he received an order from China for $10,000 of his medicines. While debating in his mind the advisability of filling the order, a draft came to hand in gold. Before this order could be filled an order came to hand for $100,000 worth, with a gold draft for the same. Dr. Jayne made money so rapidly that he went to the president of the Chestnut Street bank where he deposited and consulted him as to how he had best invest his money. The president of the bank said to him: "Dr. Jayne, you own a large amount of property, much of which is mortgaged; why don't you invest in these mortgages?" The advice was taken, the mortgages were all paid off, the last one only a short time before his death; the result was that the administration of his vast estate was comparatively simple. The following story is told of the introduction of Jayne's Hair Tonic: After the formula had been perfected Dr. Jayne tried it on his own head, which needed renovation badly. To his surprise and delight it caused the growth of a quantity of fine hair; he immediately advertised widely, "Come and see Dr. Jayne's new head of hair." The people came, and saw, and purchased, so that the preparation had quite a boom. A short time after, however, the new hair all fell out, and the invitation had to be taken out of the papers, but the preparation had been so well introduced that it continued to sell.

C. B. Lowe.

AMERICAN PHARMACEUTICAL ASSOCIATION.

Pharmaceutical Philadelphia, on the evening of January 11, opened wide her arms and extended a most hearty welcome to Dr. Eugene G. Eberle and the *Journal of the American Pharmaceutical Association,* of which he is the editor. It was a welcome to the distinguished pharmacist through which ran an undercurrent of satisfaction that Philadelphia was chosen as the home of the publication of the premier pharmaceutical organization of the country.

Representatives of every pharmaceutical organization in the city and State, as well as of the Philadelphia Chamber of Commerce, were assembled about the banquet board at the Hotel Rittenhouse to tell of their appreciation of the new honor that had come to the city, already so rich in pharmaceutical history, and of their pleasure in having with them again the man who, since he said good-bye to his Alma Mater here away back in the eighties, had done so much for pharmacy and its representatives.

Professor Eberle, who with Mrs. Eberle and their niece, Mrs. Galbraith, were the guests of the evening, was quite overwhelmed by the warmth of greeting by these old and new friends. When called upon to respond, Professor Eberle declared that all his thoughts had fled and that he could do little more than thank them all for this welcome and their many expressions of friendship and assurances of coöperation.

Not alone were these felicitations from the representatives of pharmacy, for equally hearty was the welcome of the representatives of medicine and of the business and commercial life of the city. Friends and organizations in other cities by letter and by telegram conveyed their well-wishes to Editor Eberle in commencing his work in this city.

The dinner and reception were arranged by a committee of the Philadelphia Branch, and the attendance was most representative of the interests with which Professor Eberle will be associated in his work here.

Following the dinner, a brief business session was held by the Branch, in the course of which Charles Holzhauer, of Newark, N. J., local secretary for the 1916 convention of the American Pharmaceutical Association at Atlantic City, suggested that the New York and the Philadelphia Branches of the parent organization, with the New Jersey Pharmaceutical Association, take separate days for entertainment features rather than to try to unite in arranging that portion of the program. He was of the opinion that bringing the ladies to Philadelphia on one day for a tour of its places of historical interest, and then having the men come up on another day and visit some of the manufacturing plants identified with the drug trade, would be most gratifying to the visitors as Philadelphia's portion of the entertainment. When he suggested the appointment of a committee of five, with the local president an *ex-officio* member, to coöperate in the furtherance of these suggestions, a motion to that effect was carried unanimously.

Samuel C. Henry, the president of the Philadelphia Branch, acted as toastmaster, and in his opening remarks spoke of the gratification of the Philadelphia pharmacists that their city had been made the home of the *Journal of the American Pharmaceutical Association*, and described the present occasion as a big family gathering at which those present wished to express some of the thoughts that lie upon their hearts in having Dr. Eberle, the personal representative of the honor that has come to the local pharmacists and to Philadelphia.

The office of the *Journal* has been established in the rooms of the Philadelphia Drug Exchange, and the first speaker, John Fergusson, president of that time-honored organization, spoke in a humorous vein of the many new evidences of bustle and energy that were apparent since Editor Eberle had been installed there on January 1. On behalf of his organization, which includes the manufacturing and wholesale interests of the city and vicinity, Mr. Fergusson extended a most hearty welcome, and expressed the hope that in its new atmosphere and surroundings the *Journal* and its field of usefulness would be broadened and enhanced in value, and that the guest of the evening would be spared to direct its progress for many years to come.

In speaking for the Chamber of Commerce, Howard B. French, who is the president of the Philadelphia College of Pharmacy, declared that during the forty-nine years he had been connected with pharmacy he had found the representatives of the profession proverbially modest. He said that they, like Philadelphia, were entitled to stand in the foremost rank. In conveying the welcome of the city through the Chamber of Commerce, Mr. French stated that it was "the greatest city on God's earth, and there is more home comfort to the square inch in our city than on any other spot on the globe." He spoke of the proposed plan to have the delegates at the 1916 convention visit this city, and pledged the coöperation of the Chamber of Commerce, which, with its 5000 members, "is the strongest commercial organization in the world."

Dr. S. Solis Cohen, of Jefferson Medical College, and Dr. Henry Beates, Jr., of the University of Pennsylvania, agreed that both the medical and pharmaceutical professions would be strengthened by this valuable acquisition to Philadelphia's institutions.

The toastmaster facetiously introduced the next speaker, Joseph P. Remington, as the "oldest living pharmacist and the man who founded the Philadelphia College of Pharmacy." Professor Remington referred with pride to the fact that there were eight members of the Board of Revision of the United States Pharmacopœia present. In referring to the assistance which that committee of which he is the chairman had received from other organizations, he mentioned particularly the National Association of Retail Druggists and its accomplishments along propaganda lines. He spoke of his long acquaintance with Professor Eberle, dating from the time the latter was a student in the Philadelphia College of Pharmacy, and in closing shook hands with his former pupil and said: "I have a particular pleasure in welcoming you back to the city of which, I know, you have many pleasing recollections."

Dr. Julius W. Sturmer, dean of the Department of Pharmacy of the Medico-Chirurgical College, told of the warm welcome and coöperation that had been extended to him when, a few years ago, he, like Professor Eberle, had come to Philadelphia to take up educational work. Mentioning the physical resemblance between the guest of the evening and himself, he referred humorously to an occasion when he was mistaken for the editor of the *Journal*. He declared, therefore, that in welcoming his distinguished friends he did so with particular pleasure and a sense of possible reflected glory.

Dr. John R. Minehart, dean of the Department of Pharmacy of Temple University, urged that educators in pharmaceutical colleges be impressed with the debt that pharmacy owes the American Pharmaceutical Association, and that they carry that impression along to the students in their classes.

And then came an ovation for Professor Eberle as Toastmaster Henry formally introduced him again to this gathering of warm friends. Declaring that the pangs due to the severing of the ties that had bound him to his good friends in Texas for thirty years were partly softened by the pleasure of being welcomed so warmly by his friends in Philadelphia, he said in part:

"We have come here not because we wished to, but because the association said it was my duty. I hope I did not make a mistake and that I will be able to fulfil all of the wishes of the association. The *Journal* needs the help of every member of the association. And I feel that with the help that you have so generously proffered me, the membership of the association should be greatly increased everywhere, but particularly in and about Philadelphia. I have in mind a few changes in the *Journal,* some of which will be made in the forthcoming issue. I hope they will be welcome."

He closed with a plea for continued advice and assistance for himself and his work from his Philadelphia friends, to whom he felt so close by meeting them that night.

Mrs. L. Galbraith, of Galveston, Texas, a niece to Professor and Mrs. Eberle, acknowledged the warmth of northern hospitality as evidenced on the present occasion. When Professor Remington humorously asked for an expression of her political affiliations, Mrs. Galbraith emphatically asserted her faith in the policies of the Republican party, and explained that because she came from the South it did not follow that she was a Democrat.

Toastmaster Henry, who has long been known for his belief in Jeffersonian principles, smilingly declared that that was the reason he had assigned to Professor Remington the honor of introducing Mrs. Galbraith.

The meeting closed with the reading of communications conveying to Editor Eberle the well-wishes in the new field from Professor Otto Raubenheimer, of Brooklyn; Mr. and Mrs. John G. Godding, of Boston, Mass.; Joseph L. Lamberger, of Lebanon, Pa.; Casewell A. Mayo, of New York, and the New York Pharmaceutical Association.

A vote of thanks was tendered the Committee on Reception, consisting of E. Fullerton Cook, chairman; S. C. Henry, J. R. Minehart, and J. W. Sturmer.

Professor Eberle transferred the scene of his editorial duties to Philadelphia, January 1, in accordance with the action of the Committee on Publication of the American Pharmaceutical Association in selecting Philadelphia after it had been accorded power to act on this question of the *Journal's* future home at the annual meeting in San Francisco last year.

Coming to Philadelphia in 1881 to attend the Philadelphia College of Pharmacy, he worked in the drug store of Charles Shivers, then at the northeast corner of Seventh and Spruce Streets. Soon after graduation, in 1884, he located in Texas. Becoming interested in educational work, he founded the School of Pharmacy of Baylor University at Dallas, later becoming its dean. He was also the founder and editor of the *Southern Pharmaceutical Journal.* He became editor of the *Journal of the American Pharmaceutical Association* in April, 1915.

PHILADELPHIA COLLEGE OF PHARMACY.

Minutes of the Quarterly Meeting.

December 27, 1915.—The quarterly meeting of the Philadelphia College of Pharmacy was held this day, at 4 P.M., in the library, the President, Howard B. French, presiding. Fourteen members were present. The minutes of the semi-annual meeting held September 27 were read and approved. The minutes of the Board of Trustees for September, October, and November, were read (in the absence of the Registrar) by Joseph W. England, and approved.

Mr. French reported that it was necessary for the College, under the Employer's Liabilities Act, to take out insurance for all those who were receiving compensation from the College. There was much detail work necessary to do this, although the expense was not great. In the discussion that followed this announcement, participated in by Messrs. England, Evans, French, Poley, and Remington, much valuable information was given.

Professor Kraemer spoke of the changes made in the display in the Museum since the last meeting of the College and what had been accomplished. There was still much to do, and he hoped for the coöperation and assistance of the various committees and members so that the College could offer an exhibit that would attract not only pharmacists but also the general public.

The President announced the death, on October 19, 1915, of Joseph A. Heintzelman. He had been an active member of the College since 1859, a period of fifty-six years.

Professor Remington reported the death, on November 28, 1915, of Samuel A. D. Sheppard, of Boston, Mass., long identified with pharmacy. The College conferred the degree of Master in Pharmacy on him in 1908.

The President reappointed the Committee on Legislation, as follows: Theodore Campbell, chairman; William L. Cliffe, Samuel C. Henry, Richard H. Lackey, Warren H. Poley, and Joseph P. Remington.

C. A. Weidemann, M.D.,
Recording Secretary.

ABSTRACTS FROM THE MINUTES OF THE BOARD OF TRUSTEES.

October 5, 1915.—Twelve members present. A communication was received from the Secretary of the College, announcing the election of Samuel C. Henry, O. W. Osterlund, and Aubrey H. Weightman to membership in the Board of Trustees for the ensuing three years.

The Committee on Scholarships reported the applications of twenty-five students were under consideration. They recommended the award of scholarships to twelve students, viz., seven to first-year, three to second-year, and two to third-year students.

The Committee on Examinations reported the names of Sylvan Loraine Foster, Howard J. Koch, and Max M. Waxman, who had successfully passed the required examinations and were entitled to receive the Certificate of Proficiency in Chemistry. Also that Louis George Linford had completed the course in Food and Drug Analysis and is entitled to a Certificate. Also that Carlos Maria Aguiar had completed a Special Course in the Department of Analytical Chemistry and is entitled to a Certificate of Analyst of Agricultural Products. The proper certificates were accordingly awarded.

A communication was received from the Board of Public Education naming three students of different high schools to whom they suggested that scholarships in the College be awarded.

The annual report of the Treasurer for the fiscal year ending August 31, 1915, was read and referred to the Committee on Accounts and Audit.

November 3, 1915.—Sixteen members were present. The amendments to Section 6, Article 8, of the By-Laws, relating to practical experience and previously submitted, were, on motion, adopted.

The Committee on Examinations reported that John J. Over had successfully passed the required examination and was entitled to receive the Certificate of Proficiency in Chemistry. The certificate was accordingly awarded.

The Committee on Museum and Herbarium made a verbal report, through Mr. Osterlund, relative to proposed changes in the exhibit in the Museum suggested by Professor Kraemer at the September meeting of the College, and asked for an appropriation to put up additional shelving. Mr. French quoted from the minutes of the Committee on the 50th Anniversary of the Alumni Association, giving additional information, when, on motion, the report was received and the matter of appropriation and shelving referred to the Committee on Property.

The Dean read a communication from Mr. H. O. Parrish, grandson of the late Professor Edward Parrish, relative to a copy of Parrish's Pharmacy. As the College possessed several copies, Mr. French moved that the Dean be authorized to present a copy to Mr. Parrish. So ordered.

The Dean read a communication from Professor E. F. Cook, relative to the increased work in the Department of Operative Pharmacy, occasioned by the new roster, and asked that the selection of John R. Graham, a third-year student, as student assistant, be approved. So ordered.

Mr. England referred to the communication of Miss Nagle, the librarian, in reference to procuring positions for woman students, and mentioned some of the difficulties connected with the matter. Mr. Osterlund referred to the present law governing the State Board of Pharmacy, and Mr. Henry said that the incoming Legislative Committee, appointed at the last meeting of the Pennsylvania State Association, was instructed to take up this matter with the view of having the law modified to meet present conditions. Mr. Mulford favored including manufacturing laboratories as equivalent experience for a degree, when Mr. England presented the following resolution, which was, on motion, adopted:

> *Resolved,* That the Board of Trustees of the Philadelphia College of Pharmacy favor the amendment of the State Pharmacy Law to provide that the pharmaceutical experience of hospital pharmacies and manufacturing pharmaceutical establishments shall be regarded as the equivalent of pharmaceutical experience of retail drug stores in the application for examination for registered pharmacists and qualified assistants under the State Pharmacy Law; and that the Committee on Legislation of the Philadelphia College of Pharmacy be requested to coöperate with the Committee of Legislation of the Pennsylvania Pharmaceutical Association and similar committees representing other bodies to take proper action looking towards the amendment of the State Pharmacy Law.

An application was received for active membership, which was referred to the Committee on Membership.

December 7, 1915.—Fifteen members were present. The Committee on Museum and Herbarium reported that commendable progress was being made in rearranging the cases and relabelling the specimens.

The Committee on Accounts and Audit reported they had examined the accounts of the Treasurer, Registrar, and Committee on Publication and found them correct.

The Committee on Scholarships reported that a competitive examination had been held for the Dobbins Scholarship, and of the seven who took it, George R. Mangan, of Salem, N. J., received the highest average, and they therefore recommended that the scholarship be awarded to Mr. Mangan. So ordered.

The Committee on Examinations reported that George W. Tucker had successfully passed the required examination in Analytical Chemistry and was entitled to receive the Certificate of Proficiency, which was, on motion, awarded.

The Committee on Alumni reported the action taken by the Executive Board of the Alumni Association relative to the Pennsylvania Alumni Scholarship, which, after discussion, was, on motion, adopted.

The Sub-coommittee on Athletics reported that 112 students had applied for Y. M. C. A. membership, of which number twelve were for full privileges, the others taking the optional plan.

The Committee on Membership reported favorably on the application of Ivan R. Fuss, of Class 1915, for active membership. The candidate was balloted for and unanimously elected.

The question of indemnity insurance came up and was referred to the Committee on Property.

Dean Remington referred to the calendar sent out to our Alumni in 1915 and the good he felt it did, and asked the opinion of the Board as to sending one in January, 1916. The idea met with general approval, and, on motion, the Dean was authorized to arrange for the printing and distribution of 5000 calendars, and that a letter accompany each.

The Dean spoke of a letter received from Mr. Wood, General Secretary of the Y. M. C. A., acting as secretary for the Association among colleges, stating that since the war the Association had been hunting up foreign students, not naturalized, in order to be of assistance to them. The Dean asked if there was any objection to giving Mr. Wood the names of foreign students attending the College, when, on motion of Mr. French, the Dean was authorized to furnish the names of such students.

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JOURNAL OF PHARMACY

MARCH, 1916

THE CONSTITUENTS OF LICORICE ROOT AND OF LICORICE EXTRACT.

PART 2.

By PERCY A. HOUSEMAN, PH.D., F. I. C.

Since the appearance of Part 1 [1] of this paper I have carried out a considerable amount of work on licorice, aiming at the improvement of the method of analysis, but have not seen fit to make any decided changes in the method previously given by me. The separation of the glycyrrhizin from the starch and gums is now effected with 75 per cent. alcohol, as it was found that 80 per cent. alcohol precipitated, in some cases, a small quantity of glycyrrhizin. The crude glycyrrhizin is still determined by precipitation with dilute sulphuric acid, no other method having been found practicable. The method for sugars remains unaltered, and gives reliable results.

Partly because of the imperfections in the methods of analysis, and partly because of the large fluctuations in the composition of pure licorice root and extract, chemical standards of purity have not yet been established for these materials.

In Part 1 there was discussed the behavior of various solvents toward licorice root from different localities. The quantitative differences found were much less marked than might have been expected, considering the marked differences of flavor of the various roots and extracts. These differences of flavor are possibly to be ascribed to the nature, rather than to the amount, of the flavored constituents.

A summary is here made of the results of some recent extractions of licorice root with ether, 99 per cent. alcohol, 75 per cent. (by volume) alcohol, 50 per cent. (by volume) alcohol, and water (see Tables 1, 2 and 3).

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[1] This JOURNAL, 1912 (vol. 84), No. 12, pp. 531–546.

A comparison of these results with those given in Part 1 shows:

SUBSTANCES DISSOLVED FROM LICORICE ROOT BY VARIOUS SOLVENTS.
(The solvents were used in the order given below.)

	Anatolian	Russian	Syrian	Turkish-Arabian	Spanish (Toledo)	Italian
TABLE 1.						
Root moisture.........	4.0	4.0	4.5	3.0	3.5	4.5
Ether.................	3.6	3.6	4.9	3.7	2.9	3.6
99 per cent. alcohol.....	2.0	2.2	2.1	2.1	2.0	1.6
50 per cent. alcohol.....	28.2	25.9	23.0	20.5	22.6	25.0
Hot water.............	5.5	4.7	3.9	3.9	6.4	8.2
Spent root............	56.7	59.6	61.6	66.8	62.6	57.1
	100.0	100.0	100.0	100.0	100.0	100.0
TABLE 2.						
Root moisture.........	2.2	2.5	2.2	2.2	2.0	2.1
99 per cent. alcohol	5.5	5.6	7.0	5.4	4.9	4.8
75 per cent. alcohol.....	23.3	22.2	19.1	16.9	19.7	21.2
Hot water.............	10.9	10.0	8.2	8.9	9.9	12.2
Spent root............	58.1	59.7	63.5	66.6	63.5	59.7
	100.0	100.0	100.0	100.0	100.0	100.0
TABLE 3.						
Root moisture.........	6.5	7.5	8.0	7.0	7.0	8.0
Hot water.............	37.1	35.7	31.8	29.6	33.3	36.3
75 per cent. alcohol.....	4.0	3.5	4.1	3.4	2.8	3.4
Spent root............	52.4	53.3	56.1	60.0	56.9	52.3
	100.0	100.0	100.0	100.0	100.0	100.0

1. *Ethereal extracts* range from 2.9 per cent. to 4.9 per cent. (Table 1) and agree fairly with those of Part 1.

2. *Alcoholic Extracts.*—99 per cent. alcohol extracts 4.8 per cent. to 7.0 per cent. (Table 2), whereas 95 per cent. alcohol, which was used in Part 1, extracted 10.8 to 12.7 per cent. The figures obtained with 99 per cent. alcohol give results which correspond more nearly to the true amount of total resins present than do those previously obtained with 95 per cent. alcohol, since the latter extracts from licorice root other materials besides resins, notably cane-sugar, as was shown in the detailed analysis of these extracts (Table 9, Part 1).

It is to be noted that R. Kobert,[2] in an article concerned chiefly with the saponins of licorice root, reproduces Table 8 from my previous paper. He changes the heading of column 1 of that table to "Ether-soluble resins," and the heading of column 2 to "Ether-insoluble resins"; but the latter designation is incorrect, for the reason just stated above. B. Müller,[3] in a translated summary of Kobert's article, also reproduces the same table, but has omitted to state that it is from my paper in this JOURNAL. The inference from the text of the translation is that the table is the work of Tschirch.

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[2] *Berichte der Deutschen Pharmazeut. Gesellschaft,* 1915. Heft 4, pp. 169–185.

The 50 per cent. alcohol extracts (Table 1) compare well with those published in Part 1 of this paper.

In the new results the same feature is observed as was noted in Part 1, viz., the different roots show smaller differences in the amounts extracted by the respective solvents than would be expected.

PREPARATION OF CANE-SUGAR FROM LICORICE ROOT.

Rasenack[4] appears to have been the only worker who actually obtained and identified crystals of cane-sugar from licorice root. He observed a deposition of crystals of cane-sugar from an alcoholic extract of licorice root.

I have worked out a systematic preparation of cane-sugar from the root as follows:

Russian licorice root was ground, and macerated with cold 5 per cent. (by weight) sulphuric acid. Three liquors were taken off, pressing the root between each extraction. The liquors were united, centrifuged, exactly neutralized with sodium hydrate, brought to a boil, and filtered from albuminoids. The filtrate was evaporated *in vacuo* to small volume, and treated with about six times its volume of 95 per cent. alcohol, so that the mixture contained about 85 per cent. alcohol. The starch and gummy matters, together with precipitated sodium sulphate, were removed by filtration, and the clear brown solution again evaporated *in vacuo* to small volume. The liquid was then boiled for half an hour with a concentrated aqueous solution of strontium hydrate, allowing three parts of strontium hydrate to every one part of cane-sugar supposed to be present. The precipitated strontium sucrate was filtered hot and boiled a second time with strontium hydrate solution. The strontium in the precipitate was now removed by suspending in water and passing in carbonic acid gas. The light yellow filtrate was evaporated to a syrup, and repeatedly crystallized from boiling 95 per cent. alcohol.

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[3] This JOURNAL, 1915 (vol. 87), No. 12, pp. 555-559.

B. Müller's translation of Kobert's article contains the following errata

On p. 557, instead of $C_{41}H_{64}O_{10}$ read $C_{44}H_{64}O_{19}$.

On p. 558, instead of glycyrrhetinic acid read glycyrrhetic acid.

On p. 558, instead of glycyrrhizinic acid read glycyrrhizic acid.

[4] *Arbeiten aus dem Kaiserlichen Gesundheitsamte*, 1908, vol. 28, p. 442.

The identity of the substance as cane-sugar was established by its crystalline form, by its specific rotatory power $[\alpha]_D = 66.3°$, and by analysis.

	Calculated	Found
Carbon	42.07	42.00
Hydrogen	6.52	6.43
Oxygen	51.41	51.57
	100.00	100.00

The yield of cane-sugar was about 2 per cent. of the root used.

DETECTION OF SAPONINS IN LICORICE ROOT.

At the time my experimental work was carried out on saponins in licorice root (1914) nothing had been published on this subject. The presence of saponins in licorice root was rendered probable by a number of properties of the extract.

The hæmolysis test was used for the detection of biologically active saponins. The method employed was to obtain the supposed saponin in aqueous solution and mix it with salt solution, so as to produce a liquid containing 0.9 per cent. sodium chloride, and then add a suspension, in physiological salt solution, of the washed corpuscles of sheep- or ox-blood. Solution of the blood-corpuscles shows the presence of a saponin or sapogenin, or both.

Negative results were obtained with aqueous extracts of both green and dried licorice root. Mild and strong extractions were tried, but no hæmolysis was observed at any concentration.

Negative results were also obtained with extracts in which dilute alcohol up to a strength of 50 per cent. (by volume) was employed as a solvent.

Hæmolytically active saponins were extracted from both green and dried licorice root by 75 per cent. (by volume) alcohol. The 75 per cent. alcoholic extract was evaporated to dryness, the residue extracted with cold water, and tested with washed blood-corpuscles in the usual manner. The limit of dilution for complete solution of the blood-corpuscles at room temperature was approximately 1 part of licorice root to 640 parts solution. In the particular samples tested, Syrian, Spanish, and Italian roots possessed the strongest hæmolytic power, and were followed by Russian, Anatolian, and Turkish-Arabian. It is likely that this order might be changed if a different set of samples of root were tested. I found, further, that the biologically active saponins of licorice root are in the *inner* bark, and are not contained in the outer bark, nor in the central part of the root. Comparative tests with soap-bark gave complete hæmolysis at a dilution of 1 to 2000 at 20° C.

R. Kobert [5] states that the sapogenin, glycyrrhetic acid, which is probably present in small amount in licorice root, is responsible for the hæmolytic activity of extracts from the root. It is, however, probable that glycyrrhetic acid would not be obtained in solution by the treatment of a 75 per cent.-alcohol extract with cold water. Moreover, glycyrrhetic acid is insoluble in ether, and ethereal extracts of licorice root contain hæmolytically active material. It seems likely, therefore, that licorice root contains an active saponin as well as a sapogenin. Kobert has given particular attention to the relation of glycyrrhizic acid to the saponins, and to the relation which Tschirch's formula, $C_{44}H_{64}O_{19}$, for glycyrrhizic acid bears to that of the general formula $C_nH_{2n-8}O_{10}$, which Kobert has established for saponins. Sormanni [6] found glycyrrhizic acid to be hæmolytically inactive. Kobert confirms this, and finds, further, that glycyrrhizic acid yields an active sapogenin (glycyrrhetic acid) on hydrolysis with dilute sulphuric acid. Both of these statements I have confirmed. Kobert concludes that glycyrrhizic acid is a member of the group of inactive saponins.

PREPARATION OF GLYCYRRHIZIN (GLYCYRRHIZIC ACID) FROM LICORICE ROOT.

Tschirch and Cederberg [7] have described the preparation of pure glycyrrhizin from licorice root. They precipitated an aqueous extract of the root with dilute sulphuric acid, and purified this crude glycyrrhizin by the preparation of the tertiary and primary potassium salts, passing to the free acid by means of the decomposition of the lead salt with sulphuretted hydrogen. The primary potassium salt and the free acid were purified by repeated crystallization from hot glacial acetic acid.

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[5] *Loc. cit.*

[6] *Zeit. f. Nahrungs- und Genussmittel,* 1912, 23, p. 56.

[7] *Archiv der Pharmazie,* 1907, Heft 2, p. 97.

In preparing glycyrrhizin, I first extracted decorticated licorice root about six times with 95 per cent. alcohol in order to remove resinous and bitter principles. The glycyrrhizin was then removed from the residual root with 30 per cent. alcohol, and was precipitated with dilute sulphuric acid after removal of the alcohol. It was thought that this would give a crude glycyrrhizin which would be more readily purified than that obtained by Tschirch's method of extracting the original root with water and precipitating with dilute sulphuric acid, since by this latter method a larger number of other constituents are mixed with the glycyrrhizin, and must be later separated.

The crude glycyrrhizin from 30 pounds of root was washed twenty times by kneading with warm water, and was treated with alcohol and ether as prescribed by Tschirch. The precipitates obtained from the addition of alcohol and ether were insignificant. The yield of tertiary potassium salt was 5.7 per cent. of the root. The tertiary potassium salt was converted to the primary potassium salt by means of hot glacial acetic acid. The primary salt was crystallized twice more from glacial acetic acid, and washed with the same solvent. A white product was obtained. The primary potassium salt was converted to the lead salt by dissolving it in warm dilute (1 : 4) alcohol and precipitating with basic lead acetate. The lead salt was converted to the free glycyrrhizic acid by means of sulphuretted hydrogen, according to the directions given by Tschirch. The solution of the glycyrrhizic acid was evaporated to dryness *in vacuo,* and crystallized twice from hot glacial acetic acid.

The following combustion figures were obtained after the glycyrrhizic acid had been allowed to stand over potash in a vacuum desiccator:

0.2914 g. substance gave 0.6262 g. carbon dioxide and 0.2028 g. water
0.3050 g. " " 0.6512 g. " " " 0.2110 g. "
0.2978 g. " " 0.6344 g. " " " 0.2010 g. "
0.2976 g. " " 0.6384 g. " " " 0.2066 g. "
0.3000 g " " 2.8 cc. nitrogen at 26° C. and 768 mm. pressure
0.3000 g. " " 3.0 cc. " " 23° C. " 768 mm. pressure.

		C	H	N
		Per cent.	*Per cent.*	*Per cent.*
Found	1	58.62	7.80	1.05
	2	58.25	7.75	1.14
	3	58.11	7.57	
	4	58.52	7.78	
Average		58.37	7.72	1.09
Calculated for $C_{44}H_{64}O_{19}$		58.90	7.19	
Calculated for $C_{44}H_{68}O_{19}$		58.64	7.61	
Calculated for $C_{44}H_{70}O_{19}$		58.51	7.81	
Calculated for $C_{44}H_{67}NO_{19}$		57.81	7.39	1.53
Calculated for $C_{44}H_{65}NO_{18}$		58.97	7.31	1.56
Calculated for $C_{44}H_{68}NO_{18}$		58.77	7.63	1.55

A portion of the glycyrrhizic acid upon which the above combustions were carried out was crystallized three times more from hot glacial acetic acid. Perfectly colorless crystals were obtained. This purified glycyrrhizic acid was then crystallized from 50 per cent. alcohol, from which it did not crystallize well.

Two nitrogen estimations were carried out on this product.

0.3028 g. substance gave 5.12 cc. nitrogen at 26° C. and 766 mm. pressure.
0.2748 g " " 4.54 cc. " " 22° C. " 769 mm. "

Nitrogen = 1.89 per cent., 1.89 per cent.

It is not intended to controvert here the finding by Tschirch, that glycyrrhizic acid contains no nitrogen. Tschirch has been confirmed in his work by Rasenack. It is, however, very remarkable that this substance, if free from nitrogen, should so tenaciously hold a nitrogenous impurity, in spite of the elaborate purification outlined above.

The glycyrrhizic acid, prepared as above described, became brown at 185° C., and partly melted, with frothing, at 203° to 205° C. It readily dissolved in warm water, and gelatinized on cooling.

Its behavior toward sulphuric acid and toward bromine is different from that of glycyrrhizin which has not been crystallized from acetic acid. A drop of twice normal sulphuric acid added to 1 cc. of a moderately strong aqueous solution of the purified glycyrrhizin produced no immediate precipitate. After some time the liquid became opalescent, but cleared on warming, and on subsequent cooling a granular precipitate was deposited, which redissolved on warming. Glycyrrhizin which has not been purified by crystallization from acetic acid is precipitated even by very dilute sulphuric acid, and the precipitate does not redissolve on warming. Pure glycyrrhizic acid absorbs bromine in the cold, but gives no precipitate. Impure glycyrrhizin or an aqueous solution of licorice extract gives an immediate precipitate with bromine, even in very dilute solution. The precipitate contains all of the glycyrrhizin, and is not dissolved on warming.

It is not clear why the glycyrrhizin purified with acetic acid should behave differently from crude glycyrrhizin toward bromine and toward sulphuric acid unless glycyrrhizic acid, being relatively sensitive towards decomposition, has possibly suffered some change by the action of hot glacial acetic acid.

Oxidation of Glycyrrhizic Acid with Potassium Permanganate.

One gram glycyrrhizic acid was dissolved in a solution of 1 gram potassium hydroxide in 50 cc. water, and 3 grams potassium permanganate in 60 cc. water were added. After heating on the water-bath for 1 hour, the permanganate was decolorized. A further 1-gram permanganate in 20 cc. water provided an excess. Added 2 cc. alcohol (until the purple color was just destroyed). Filtered, and neutralized with dilute hydrochloric acid. The white flocculent precipitate (0.2 gram) was practically tasteless, and will be further investigated.

Oxidation of Glycyrrhizic Acid with Nitric Acid.

One gram glycyrrhizic acid was treated with 10 cc. fuming nitric acid. Brisk action occurred, with the development of heat and evolution of nitrous fumes. The blood-red solution was poured into water. The light yellow precipitate was very bitter, and was readily soluble in alcohol and in ammonia. The filtrate contained oxalic acid, and also a substance which dyes animal fibres a fast yellow. The solution of this dye has a very bitter taste, but does not contain picric acid.

The resins (soluble in ether) and the bitter principles (soluble in alcohol, insoluble in ether) of licorice root both show behavior toward nitric acid similar to that shown by glycyrrhizic acid.

ISOLATION OF A YELLOW DYE FROM LICORICE ROOT.

A piece of silk dipped in an aqueous licorice extract is dyed a pale but fast yellow. The dye is obtained by percolating licorice root with hot water, evaporating the solution to dryness, and extracting with absolute alcohol. The alcoholic solution is evaporated to dryness, and the dye extracted with hot water. The dye is not picric acid.

I wish to express my thanks to Mr. Bertrand Schneeberg for valuable assistance in this work, and to the MacAndrews & Forbes Company for generously encouraging it, even though direct commercial application of the results may not always be evident.

Laboratory of the MacAndrews & Forbes Company,
Camden, N. J., December, 1915.

COSMETICS AS DRUGS.

A REVIEW OF SOME OF THE REPORTED HARMFUL EFFECTS OF THE ORDINARY CONSTITUENTS OF WIDELY USED COSMETICS.[1]

By MARTIN I. WILBERT, Technical Assistant Division of Pharmacology Hygienic Laboratory, United States Public Health Service.

Of the many and varied abuses of drug products there is none in which fraud, deception and a wanton disregard for human health and even life are so clearly evidenced as in connection with the manufacture, sale, and use of so-called "cosmetics."

While no one can deny that emollient, irritant, and even caustic drugs, applied as cosmetics, have a legitimate and an important field of usefulness, the abuse of these same drugs, because of the misleading claims made in connection with many of the so-called cosmetics of a proprietary nature, involves a menace that should be recognized and guarded against.

More than thirty years ago, Tuttle (*Med. Rec.*, 1884, vol. 25, p. 257), in discussing the constituents and general effects of this class of preparations, said: "It is a reproach to modern civilization that one should find occasion in this day of enlightenment to raise his voice against the use of cosmetics."

That this statement is even more applicable to-day than when it was written is evidenced by the following table compiled from the publications of the Thirteenth Census of the United States:

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[1] Reprint from the Public Health Reports, vol. 30, No. 42, October 15, 1915.

Number of Establishments Engaged in the Manufacture of Perfumery and Cosmetics, the Cost of Materials Used, and the Value of the Product as Manufactured, Compared with the Population of the United States, Exclusive of Outlying Possessions, During the Corresponding Period.

[Thirteenth Census of the United States, 1910, vol. 8, p. 452; and vol. 1, p. 127.]

Year	Number of establishments	Cost of material	Value of product	Population of United States	Year of census
1879.............	67	$1,201,409	$2,203,004	50,155,783	1880
1889.............	157	2,128,420	4,630,141	62,947,714	1890
1899.............	262	3,135,017	7,087,704	75,994,575	1900
1909.............	429	5,634,031	14,211,969	91,972,266	1910

The establishments included under the heading "perfumery and cosmetics" are those engaged principally in the compounding of perfumes, face lotions, and cosmetics generally, and the list does not include the many hundred laboratories in which these same preparations may be compounded as a side line. Including the value of the product made by laboratories primarily engaged in the compounding of regular pharmaceutical preparations, a very conservative estimate of the cost of cosmetic preparations to the consumer would be in excess of $50,000,000 annually.

Among the preparations usually classed as cosmetics for use on the head and face we have: Hair washes, hair tonics, hair dyes, shampoo powders, complexion powders, toilet powders, moth and freckle lotions, face enamels, toilet waters, toilet vinegars, grease paints, face creams, liquid enamels, beauty washes, and the many preparations that are offered as a "skin bleach."

The misuse of drugs in the form of "beautifying agents" is principally due to the fact that the federal and many of the state food and drug laws do not include preparations made and sold as cosmetics, unless curative claims are made on the label or in the literature accompanying the package as proof that the preparation is sold or is to be used "for the cure, mitigation, or prevention of disease either of man or other animals."

In only five states and the territory of Hawaii is the definition of a drug sufficiently broad to include preparations sold as cosmetics, but even in these states no provision is made to warn the purchaser of the presence of harmful or deleterious substances.

The general adoption of the more comprehensive definition of a drug to include antiseptics, disinfectants, washes, perfumes, and cosmetics would tend to provide some degree of control over preparations of this kind and prevent much of the present-day fraud. It would, however, fail to efficiently safeguard the user unless the list of drugs to be announced on the label were at the same time extended to include the many poisonous drugs that are at the present time falsely labelled " harmless."

As an illustration of the fraudulent practices existing in connection with the manufacture and sale of toilet preparations it will suffice to quote the following from recent reports of chemists in charge of State laboratories:

Barnard, H. E. (Rep. Indiana Bd. Health, 1912, 1914, p. 455): Eighty-one samples of preparations used as hair tonics, skin foods, cold creams, mouth washes, and lotions of varying character were examined. Thirty of the samples were classed as illegal. Seven contained methyl or wood alcohol.

Newcomb, George D. (*Proc. Iowa Pharm. Assoc.*, 1914, p. 28): Of the 66 toilet preparations examined, 20 contained methyl alcohol. Among the toilet preparations were the following: egg shampoo, hair tonics, bay rum, witch-hazel, toilet waters, Florida water, and perfume.

The dangerous character of wood alcohol is so well established that it would appear almost incredible that any one would dare offer a preparation containing it for use on the human body. A recent editorial on the subject (*Jour. Amer. Med. Assoc.*, 1914, vol. 62, pp. 538–539) asserts that nearly a thousand cases of poisoning attributed to wood alcohol have been reported in the literature since 1893. Many state laws, however, specifically permit its use in preparations designed for external application, and even in states in which such use is illegal it is difficult to secure the conviction of persons selling preparations containing it.

Wood alcohol is, however, but one of the many poisonous drugs that have been found in so-called " cosmetics." Many writers and investigators have from time to time called attention to the possible harmful effects of preparations that are sold as beautifying agents, but up to the present time the problems involved have not been given the attention they properly deserve.

Of the potent drugs of a possibly harmful nature that are used in so-called "hair restoratives" it will suffice to mention: Lead acetate, silver nitrate, paraphenylene diamine, and resorcin.

The beauty washes and face enamels contain an even more impressive array of dangerously potent drugs, including: Flake white, or lead carbonate; diachylon, or lead plaster; corrosive sublimate, or mercuric chloride; calomel, or mercurous chloride; white precipitate, or ammoniated mercury; pearl white, or bismuth subnitrate; zinc white, or zinc oxide; Chinese white, or commercial zinc oxide; zinc soap, or zinc stearate.

The first of the above list, the ordinary white lead of commerce, is also known as body white, silver white, Dutch white, French white, London white, Roman white, and China white. It is generally recognized as the most common cause of industrial lead poisoning, the prevention or possible abolition of which is attracting the attention of scientists in all parts of the world. No less than 15 states have enacted laws requiring the systematic reporting of occupational intoxications, and in an even larger number of states laws are in force which are designed to prevent, or at least to reduce, the number of cases of industrial poisonings.

Despite the amount of time that has been devoted to the study of industrial poisons, our knowledge of the various problems involved is even now incomplete, and the ultimate effect of the subacute or chronic form of poisoning by salts of the heavy metals on the morbidity and mortality of those afflicted is as yet a fertile field for investigation. Enough is known, however, to show that the list of industrial poisons is a long one and that the various salts of the heavy metals are among the more harmful of these many poisons.

To the toxicologist it must appear strange that, notwithstanding the fact that the toxicity of the so-called heavy metals and their salts is well recognized, many of these substances are offered and are widely sold as cosmetics with the claim that the preparations containing them are absolutely harmless.

The absorbability of the salts of the heavy metals and their toxic properties when absorbed have been known for many years. It has also long since been recognized that females are more susceptible to plumbism than males. This is thought to be due to the harmful effects of lead upon the blood and the blood-making organs of the body and the greater dependence of females on a normal blood supply. For this same reason, no doubt, young women are more susceptible to plumbism than are those more advanced in years.

In both sexes and at all ages, however, the nature of the injury done makes cases of poisoning by any of the salts of lead difficult to recognize, more particularly as the obtainable history is at times misleading.

Robinson (*Jour. Amer. Med. Assoc.*, 1915, vol. 64, pp. 814–815) reports two cases of lead intoxication due to skin absorption from a cosmetic. He expresses the belief that many cases of general nervous debility, some of insanity, and perhaps some of paralysis are caused by the use of cosmetics containing lead. Many of the vague and little-understood abdominal pains of women are due to this cause, and abdominal sections have been done because of lead colic.

Sante (*Jour. Amer. Med. Assoc.*, 1915, vol. 64, pp. 1573–1574), in reporting two additional cases of lead neuritis from cosmetics, expresses the belief that out of the thousands of girls who use preparations containing lead there must be many cases in which the untoward effects are not readily recognized as being due to lead poisoning and which are consequently overlooked. The relative infrequency with which lead poisoning is diagnosed in women leads one to believe that it must be often overlooked.

Early in the nineteenth century it was asserted that a zinc dyscrasia analogous to a chronic lead poisoning may be produced either by the frequent use of medicinal doses of the agent, by the inhalation of zinc fumes, or by the absorption of salts of the metal through the unbroken skin.

While observers have differed in their opinions regarding the toxic properties of zinc and its salts, it is now definitely established that occupational brass poisoning or brass founders' ague is due to the zinc that is present in the mixture, and that the several salts of zinc may produce a form of intoxication simulating that caused by the salts of lead.

It has been claimed by some that patients suffering from zinc poisoning are even more subject to a general progressive muscular atrophy than are those suffering from lead poisoning, and that the gastro-intestinal symptoms as well as the nervous symptoms are equally severe.

Acute, subacute, and chronic poisonings by the several salts of mercury are more readily induced than are the corresponding intoxications by lead and zinc. Salivation, accompanied by torturing cramps and nausea, has been caused by the local use of calomel and other insoluble salts of mercury and also by weak solutions of mercuric chloride.

Hydrargyria, or mercury intoxication, begins usually with salivation, accompanied by redness and swelling of the gums, and is followed by stomatitis, diarrhœa, and a marked disturbance of the central nervous system.

The very common occurrence of mercuric chloride or corrosive sublimate in the moth and freckle lotions sold at the present time is deserving of special attention.

Mercuric chloride is an efficient local irritant, and properly used will destroy the outer layer of the skin, and in this way remove moths and freckles. It is, however, as noted above, also a systemic poison that may be absorbed through the unbroken skin in sufficient quantities to cause a chronic, or even a subacute, form of mercurial intoxication. Used on an open sore or on abnormal skin, it may cause acute and even fatal poisoning.

The insoluble salts of bismuth were long supposed to be comparatively innocuous, but their more recent use in connection with X-ray examinations of fistulous tracts has shown that they may have toxic properties.

When insoluble bismuth salts are brought into contact with open wounds soluble compounds are produced that are toxic in character, producing symptoms similar in nature to those characteristic of mercurial intoxication.

Tuttle (*Med. Rec.*, 1884, vol. 25, p. 258) reports having come in contact with five cases of poisoning by cosmetics, in which the toxic agent was undoubtedly an insoluble salt of bismuth. The characteristic symptom was clamminess of the skin, accompanied by nausea and spasms, differing in degree only from those of lead, mercury, and zinc.

Even the salts of magnesium are not without possibilities for harm Meltzer and Auer have shown that when introduced into the circulation, magnesium salts are highly toxic and may produce kidney lesions, as well as profound respiratory disturbances, and even death, in warm-blooded animals. Whether or not these substances can be absorbed through the unbroken skin has as yet not been demonstrated. but the use of insoluble compounds of magnesia in dusting powders on open wounds or broken skin is not to be recommended, nor is the long-continued use of any of the now widely-advertised lotions containing magnesium sulphate or Epsom salt advisable.

The latter preparations serve very well to show the gullibility of that portion of the public that is desirous of improving its facial appearance. As Epsom salt, magnesium sulphate can usually be purchased for 5 cents a pound, while in the form of any one of the popular skin or wrinkle lotions it is sold at the rate of from $2 to $4 a pound.

Paraphenylene diamine is an aniline derivative, which by oxidation becomes black or brown. The poisonous qualities of this chemical are well known. A number of cases of poisoning from the use of the compound as a hair stain and even from wearing hose dyed with this chemical have been reported.

Resorcin is one of the frequently occurring constituents of hair tonics. In common with other coal-tar derivatives, it is highly toxic, because of the production of methæmoglobin. Some persons are particularly susceptible to its influence, and many cases of collapse and even death from the external use of resorcin are on record.

In conclusion it may be worth while to quote from some of the published analyses of cosmetics to demonstrate the dangerous character of many of these preparations and the fraudulent nature of others.

More than 40 years ago (AMER. JOUR. PHARM., 1870, vol. 42, p. 362) C. F. Chandler, in a report, stated that of 16 hair tonics, washes, and restoratives analyzed 15 contained lead, generally in the form of acetate; the remaining preparation contained silver nitrate. Of the sixteen preparations reported on by Chandler in 1870, eight are still sold and two were recently examined by Street (Rep. Connecticut Agric. Exper. Sta., 1914, pp. 281–291). One of these preparations now contains approximately twice the amount of lead found by Chandler, and the other has been converted into a sulphur-containing preparation with the active ingredients enumerated on the label. Of the remaining four hair restorers examined by Street, two contained lead, one silver nitrate, and one paraphenylene diamine, the poisonous coal-tar dye referred to above.

Chandler, in the report previously quoted, states that of six lotions or washes examined, only one contained lead or other injurious metals. This preparation, a moth and freckle lotion, contained both mercury and zinc and is still being sold. Street, in the more recent report, found that out of seven preparations for the removal of freckles, four depended chiefly on the action of mercuric chloride, one contained mercuric chloride and lead, and two contained ammoniated mercury or white precipitate.

Chandler, in 1870, found that three of the seven face enamels examined at that time contained zinc oxide, three contained lead carbonate, and one calcium carbonate. Tuttle (*Med. Rec.*, 1884, vol. 25, p. 257) found that three of the eight face enamels examined by him contained lead carbonate, one contained calomel, two contained zinc oxide, and two contained zinc oxide and calcium carbonate. .

It may be said that many of the so-called beauty lotions and toilet powders are primarily fraudulent in that their efficiency may be questioned, and the retail price of any one of this type of preparation is out of all proportion to the actual value of its components. Thus Street, in the recent Report of the Connecticut Agricultural Experiment Station, enumerates no less than five preparations for the removal of wrinkles which were found to consist chiefly of commercial Epsom salt.

An even more recent illustration of deliberate fraud practised in connection with the sale of toilet powders is to be found in a paper by C. H. LaWall (AMER. JOUR. PHARM., 1915, vol. 87, pp. 293–299). Of sixteen samples of rice powder examined, but two were genuine and only six contained rice starch at all. In eight of the samples, corn starch was used in place of the more expensive rice starch, and in two samples no starch of any kind was present, the constituents being wholly of a mineral origin. Talc was present in thirteen of the sixteen samples referred to.

The composition of the several samples is well shown by the following table:

Table Showing the Per Cent. Composition of 16 *Samples of Rice Powder, or "Poudre de Riz," Examined by LaWall.*

Number of sample	Rice flour	Corn starch	Talc	Zinc oxide	Chalk	Bismuth subnitrate
1		100				
2	50		40	10		
3		17	70		13	
4		50	25		25	
5		7	93			
6	25		60	15		
7	18		70		12	
8			75	25		
9		90	7	2		1
10		90	7	2		1
11		62	38			
12			67	33		
13		62	38			
14	100					
15	100					
16	50		25	25		

From a study of the available data it may be concluded that—

The poisonous nature of wood alcohol, in all of its several forms, is so well established that its presence in cosmetics or other preparations for external use on the human body should be prohibited by law.

Salts of the heavy metals, particularly salts of lead, zinc, mercury, and bismuth, may be absorbed from cosmetic preparations and produce their characteristic constitutional effects.

Women are more susceptible to these several intoxications than men, and the resulting symptom-complex is more likely to be overlooked or mistaken for a natural physiological disturbance.

Cosmetics, as ordinarily used, tend to clog the pores or irritate the skin and are thus likely to interfere with the normal, healthy action of that organ.

To prevent serious intoxications and to preclude obvious deception and fraud, cosmetics should be classed as drugs, and proprietary preparations sold as cosmetics should be required to state on the label the name of any poisonous ingredient that may be contained therein.

QUARTERLY REVIEW ON THE ADVANCES IN MATERIA MEDICA AND PHARMACY.

By John K. Thum, Ph. G., Pharmacist at the German Hospital, Philadelphia, Pa.

The Committee on Publication of the *Journal of the American Pharmaceutical Association* has decided, after careful consideration of the subject, that the best interests of the Association will be served if the editorial office be established in the city of Philadelphia. As this city has always been recognized as the centre of medical education, and still holds that proud distinction, and as the same might be said of it from the pharmaceutical standpoint, it being the home of the first and oldest college of pharmacy in the Western Hemisphere, as well as the home of two other colleges of pharmacy of good repute, the environment will be of a kind that cannot help but be of great helpfulness alike to the editor and the committee. Here reside the chairman of the Pharmacopœial Revision Committee and quite a few of its ablest workers. Philadelphia was among the very first to organize a branch of the Association, and the work accomplished by this body has been of vast benefit, not only to the members thereof, but to pharmacy in general; the commercial as well as the professional side of the calling benefiting by its activity.

On Tuesday evening, January 11, the local Branch held a reception at The Rittenhouse in honor of the editor of the *Journal,* Prof. E. G. Eberle. The large attendance of members and specially-invited guests representative of the medical profession and the business interests of the city, as typified by such organizations as the Chamber of Commerce and the Philadelphia Drug Exchange, and the speeches of welcome delivered by these gentlemen, to say nothing of the warm words of welcome uttered by those who represented the pharmaceutical side of the gathering, surely must have convinced the distinguished guest of the sincerity of the welcome extended to him.

That the larger interests of the City of Brotherly Love appreciate the establishing of the *Journal of the American Pharmaceutical Association* here is clearly evidenced by an editorial that appeared in the *Philadelphia Public Ledger* on January 27. It is as follows: "The transference of the *Journal of the American Pharmaceutical Association* is another straw that shows where the true interests of the trade and profession lie, whether it be in the matter of drugs or their classification or the special education and training as druggists and doctors, whose interests interlock in every way. And as this concentration of interests here, industrial and educational, keeps up it is not too much to expect that the long-hoped-for creation of a great combined school for higher medical research will become a fact. New York, which is after it under the leadership of Columbia University, has not yet landed the prize, and the natural advantages of Philadelphia, with our signal lead as the most important medical centre in the country, with an unsurpassed background, ought to make it possible for this city to win out. With such a school we should not only have all the United States at our doors, but, as every one knows, the steady drift of Central and South America here for medical training would be accelerated; and we should be at the head of advanced work for the entire Western Hemisphere in the study of a preparedness in eliminating disease, reducing suffering, and saving life that would be the glory of the age."

The attempt of interested parties to have the Sherley Amendment to the Food and Drugs Act declared unconstitutional has failed. It will be remembered that this amendment declares a drug misbranded if false and fraudulent therapeutic claims are made in reference to it. On January 10 the highest court in the land, the United States Supreme Court, Justice Hughes delivering the opinion, every member of the court having agreed to it, stated: "We find no ground for saying that Congress may not condemn interstate transportation of swindling preparations accompanied by false and fraudulent statements, as well as lottery tickets." Thus closes another chapter in the attempt to weaken a law that has done so much to safeguard the health of the public.

At the Baltimore Branch of the American Pharmaceutical Association, in December, a joint meeting was held with the local retail association, the principal topic of the gathering being the value of advertising. Some of the remarks of the advertising expert, Mr. J. Thomas Lyons, who addressed the gathering, are pertinent, and it may not be amiss to quote them: "It doesn't matter how long you have been in business, you have been advertising from the very first day you opened your door. Every package that leaves your store is an advertisement for you; the clothes you wear; the things you say; the manner in which you treat your fellow-men; the manner in which you walk down the street are all advertisements in the truest sense of the word. . . . Advertising does not necessarily mean bill-boards, street cars, newspapers, blank walls, circulars, programs, letters, or any one specific thing, but advertising means anything that attracts the attention of one person or of a million people to your business or to you personally as the proprietor of that business, and if the retail druggist could only realize that almost every waking hour he is advertising or *mis*-advertising his business, he would pay some attention to the importance of correct advertising." The kernel in the nut is the word "correct," and to be able to advertise correctly a man must be efficient, and his whole environment and every action must be such as to give that impression to those whom he would reach.

The *Journal of the American Pharmaceutical Association* for January contains the entire address of Mr. Lyons and is well worth a perusal.

The *Journal of the American Medical Association* contains an article on "The Nature of Pharmaceutic Naphthene Oil (Liquid Petrolatum)," by Benjamin T. Brooks, Ph.D., Pittsburgh, Pa., which is of considerable interest. It gives the sources of liquid petrolatums, their composition and the various types, and offers a suggestion on the need of a proper and uniform nomenclature. In the same number of the *Journal*, under "Current Comment," the advisability of changing the name of this oil is deprecated, there being no good reason advanced for such a change. The comment of the *Journal* is decidedly interesting, and we give it in its entirety: "What is Liquid Petrolatum? The use of liquid petrolatum in chronic constipation, which has recently become the vogue, has naturally been commercialized; as a result, also naturally, claims of superiority of one brand over another have been made. Some of these claims have been well founded; others certainly are not. Some have claimed superiority for those products made from Russian oil over those made from American oils. As naphthene hydrocarbons predominate in Russian crude petroleums, and paraffin hydrocarbons in many or most American crude petroleums, it was assumed that the petrolatums derived from these sources differed from each other in like manner. Both the naphthenes and the paraffins are chemically inert; but some unexplained therapeutic superiority has been assumed to reside in the naphthenes. Consequently, it has been urged that the American liquid petrolatums should not be used internally. So far these claims and counter-claims have been based on much theory and little fact. The *Journal* publishes this week a contribution by Benjamin T. Brooks, Senior Fellow in charge of petroleum investigations at Mellon Institute, Pittsburgh. Brooks calls attention to the fact that Marcusson, in 1913, pointed out that most of the so-called mineral oils used for therapeutic purposes contain no paraffin hydrocarbons whatever; that they consist solely of naphthenes and polynaphthenes. Brooks confirms this statement so far as American liquid petrolatums are concerned. He states that many American petrolatums, such as most of those from the Gulf region, are like the Russian in containing no paraffin; and that, in the case of those petroleums that do contain it, the customary refinery method of removing paraffin is sufficient to produce true naphthene and polynaphthene petrolatums. 'The claim that only Russian oils belong to this class,' he says, 'has no basis in fact and has been advanced presumably for business reasons.' The name 'paraffin oil' applied to these liquid petrolatums, then, is a misnomer. The new name, 'white naphthene oils,' suggested by Brooks, seems superfluous, however, since the pharmacopœial title, 'liquid petrolatum,' is subject to no such objection." (*Journal of the A. M. A.*, January 1, 1916.)

CHEMISTRY AND PREPAREDNESS.—Under the foregoing title the *Philadelphia Public Ledger* gives recognition to the immense value chemistry plays in our modern civilization. It may not be amiss to quote this brief editorial: "Civilization has been defined as a mere matter of chemical output. Primitive peoples know little of chemistry or its products; some distillation and a little metallurgy suffice for their needs, and their chemical imports or exports are negligible; and all the uncivilized peoples of to-day, such as Morocco, are in the same boat. But with the great civilizations things are entirely different, even if it be but a matter of soap, one of the fundamental chemical preparations, whose use and production are said to indicate more clearly than anything else the precise place in the scale of advancement at which any nation may have arrived. And if Germany be taken as the standard of military preparedness, it is also at the very top in the greater issue of chemical preparedness, on which all the arts and industries rest.

"Consequently the plans that have been proposed to make the Graduate Engineering School of Columbia University a great research centre for chemical studies are not only worth while putting into effect there, but also call for imitation everywhere. Industrial efficiency means in every case chemical efficiency; and if we are to organize our resources for the future, the first thing necessary is to insure our chemical independence, and it cannot come too soon. Germany found out it could not do without the professor, especially professor of chemistry, and no more can we." (Editorial, *Philadelphia Public Ledger,* December 27, 1915.)

DIGITALIS MEDICATION.—The following report of the Council on Pharmacy and Chemistry of the American Medical Association in reference to the question of digitalis medication is timely. At the present time the medical profession is being flooded with the output of many manufacturers, each claiming for his particular product marvellous advantages; these wonderful and astonishing advantages somehow fail to materialize, and the doctor goes back to the freshly-prepared infusion and a tincture prepared by his most reliable neighboring pharmacist. And the thoughtful doctor will always see that that type of pharmacist, and no other, does the dispensing for his patients: "Proprietary Digitalis Preparations," Report of the Council on Pharmacy and Chemistry.

The Council has authorized publication of the following expression of its views.

W. A. Puckner, *Secretary.*

"It is becoming increasingly apparent that the tincture of digitalis produces the full therapeutic effects of digitalis, and that when it is properly made it is as stable as any liquid preparation of digitalis now available; and that the tincture has the systemic side actions of digitalis, including the emetic, in no greater degree than the various proprietary preparations of this drug to be found on the market.

"While in itself the market price of a valuable therapeutic agent is of comparatively little moment, the fact remains that the price at which many of the proprietary preparations are sold—often 100 times that of an equivalent amount of the drug—serves as a constant stimulus to the exploitation of these extravagant claims, and it is commonly sought to enhance their reputation by exaggerating the disadvantages of the official drug and its preparations.

"The Council especially emphasizes the fact that this statement is not intended to lessen the efforts that are being made to find new and better preparations of digitalis; its protest is against the deliberate misrepresentations of those manufacturers who seek to magnify the difficulties in the use of digitalis, by therapeutic exaggeration on the one hand, and by an exaggeration of the side actions of digitalis and the instability of its preparations on the other.

"Strophanthin and crystalline ouabain are now available in sterile solution in ampoules, and afford a convenient means of promptly securing the cardiac action by intramuscular or intravenous injection." (*Journal of A. M. A.,* December 4, 1915, p. 2024.)

The Stability of the Infusion of Digitalis.—It always has been taken for granted that the galenical preparations of digitalis, and particularly the infusion of digitalis, are very prone to deteriorate. It is doubtful if this is true of preparations made with a menstruum of 60 to 75 per cent. alcohol, but it is assuredly so of the infusion of digitalis. Many physicians have had it proved to them clinically. The writers of this paper, however, state that, while there is undoubtedly deterioration, this does not take place as rapidly and readily as commonly believed. Their method of proving this was to test the infusion when freshly made, and at intervals after having been subjected to various conditions, such as exposure to air, changes of temperature, and contact with infected organic matter, by its activity on cats. This method is known as the cat-method, and was originated by one of the writers. It is essentially the injection of the test-preparation slowly and continuously into the vein of a cat until death results. Mention is made that the official direction to make the infusion by exhausting the bruised leaf is inadequate. We hope that the Revision Committee of the Pharmacopœia has taken steps to correct this. (At the German Hospital, Philadelphia, the powdered drug has been used for years in making the infusion.) They made their infusion by infusing the powdered drug on a water-bath at 95° C. for an hour. While they admit that the infusion is not a stable preparation, yet it is no more so than other vegetable infusions; the long-standing opinion that it is especially unstable is not borne out by their experiments. Their conclusions are as follows: (1) The infusion of digitalis is fairly stable when prepared and kept with ordinary care, no important change then occurring within a week. (2) The addition of alcohol to the infusion is unnecessary. (3) Old, and even mouldy, digitalis and its infusions may give the typical digitalis actions qualitatively so long as they retain any considerable degree of activity. (4) A properly-made infusion of digitalis represents the leaf practically in its entirety, the action being qualitatively like that of the tincture. (5) Owing to the variability in the activity of the infusion as it is commonly obtained, the tincture should be preferred to it in therapeutic practice. (By Robert A. Hatcher, M.D., and Cary Eggleston, M.D., *Jour. A. M. A.,* November 27, 1915, p. 1902.)

NITRIC ACID FROM AIR.—According to statements appearing in the daily newspapers, plans are well under way for the manufacture of nitric acid from nitrogen extracted from the air. James B. Duke, one of the officers of the Southern Electro-Chemical Company, is quoted as saying that his company will be able to market this important and necessary acid by the 1st of January. Mr. Duke's company expects to turn out four tons of nitric acid daily from its works at Great Falls, S. C. The same work will very likely be carried on in Canada by the Quebec Development Company, of which Mr. Duke is the president.

The above announcement is very encouraging and makes one feel hopeful that the people of this country are awake to the necessities arising because of the terrible conflagration taking place in unhappy Europe and other parts of the world. Just a few weeks ago Brigadier-General William M. Crozier, chief of ordnance of the United States Army, in his annual report, strongly recommended that the nation take steps to be independent of the Chilean beds for the nitrates used in the manufacture of gunpowder, and touched upon this very question of fixation of nitrogen from the atmosphere. Its value from the standpoint of military necessity cannot be gainsaid, but from the larger economic question of the development of agriculture and industry in general its value can hardly be overestimated.

PRINCIPLES UNDERLYING THE USE OF VACCINES, BACTERINS, ANTITOXINS AND IMMUNE SERUMS AS AGENTS FOR THE PREVENTION AND CURE OF INFECTIOUS DISEASES.—As the title will no doubt indicate to most readers, this paper is a most comprehensive handling of a side to the treatment of disease to which many pharmacists are more or less a stranger. As the pharmacist is looked to by the doctor as the distributer, not only of the orthodox style of medication, but likewise of all the various biological preparations that are coming into vogue, it behooves the up-to-date pharmacist to become familiar with this class of preparations. This paper was read before the Scientific Section at the last meeting of the American Pharmaceutical Association. The first of a series of three instalments appears in the December issue of the *Journal of the American Pharmaceutical Association* and contains all the latest knowledge of that interesting branch of medicine: knowledge that the progressive pharmacist really cannot do without. (*Journal. of A. Ph. A.*, December, 1915, p. 1440, by F. E. Stewart, Ph.G., M.D., Phar.D.)

STABILITY OF PREPARATIONS CONTAINING YELLOW PHOSPHORUS.—Methods of assay are given to determine the amount of phosphorus remaining in various pharmaceutical preparations examined from time to time. It was found that preparations with phosphorus as part of their composition kept rather well under ordinary conditions. Those preparations that contain vegetable matter are more readily decomposed. A tabulation is given which shows that elixir of phosphorus, and combinations of phosphorus with nux vomica and likewise with damiana, keep well for about five months; after that time a rather quick dissipation of the yellow phosphorus takes place. (*Jour. A. Ph. A.*, December, 1915, p. 1451, by H. Engelhardt and O. E. Winters.)

SEMPERVIRINE FROM GELSEMIUM ROOT.—Further results are given in reference to the separation of this alkaloid from a mixture of alkaloids, or, to be more correct, a mixture of the total alkaloids from gelsemium. Concise information is given as to the best way to isolate the drug and to prepare some of its salts. It is also brought out that gelsemium root contains two alkaloids. How to separate the various alkaloids is clearly stated, and the results of some preliminary biological experimenting on the action of sempervirine show that the salt apparently has no immediate toxic effect, although the toxicity of this drug is proved. (*Jour. A. Ph. A.,* December, 1915, p. 1458, by A. E. Stevenson and L. E. Sayre.)

COLOR REACTIONS.—Color tests made on thirty-five alkaloids and eighteen other organic compounds give convincing evidence that there is a wide difference in the shades of color produced by given reagents. Among some of the conclusions arrived at is the great difference in the sense of vision and the ability or lack of ability to distinguish different shades and colors on the part of different individuals. Impurities in the compounds under investigation and the reagents used to determine their identity are also most important factors. The advisability of using only freshly-prepared test solutions is also suggested, and the amount of the reagent to be added to the substance under examination is likewise important. In brief, this paper impresses one as to what every chemist should know and practise—care and thoughtfulness in his work. (*Jour. of the A. Ph. A.,* December, 1915, p. 1467, by E. A. Ruddiman.)

QUICKSILVER.—According to the *Pharmaceutical Journal and Pharmacist* of London (November 20, 1915, p. 658), a deposit of mercury is being prospected near Thames, in New Zealand. It is asserted that a high-grade ore has been secured and forwarded to Sydney. Experts who have examined the deposit are very much impressed with the possibilities of this find.

CAFFEIN.—It may be of interest to know that this drug is being manufactured on a commercial scale in Japan. Further development of this industry, it is hoped, may result in the exporting of this drug. It is stated that before the outbreak of the war there had been a regular business of exporting from Japan tea sweepings, which were bought mostly by German firms. It is very probable that these were used for chemical manufacture. The Japanese, with their customary alertness, are now buying up all the tea sweepings themselves and making all the caffein they need. (*The Pharmaceutical Journal and Pharmacist,* November 20, 1915, p. 20.)

VARIATIONS IN THE ALKALOIDAL CONTENT OF BELLADONNA.—The Department of Agriculture reports the result of some experimental work having for its object the determination of the conditions which influence the alkaloidal content of this important plant.

It is shown that the first-generation plants secured from seed of cross-pollenated selected individuals display the characteristic of the maternal parent with regard to alkaloidal productivity. This condition is generally true for at least two seasons. (A. F. Sievers, Bulletin No. 306, U. S. Department of Agriculture, 1915.)

BRAZILIAN JALAP.—It is evident that Brazilian jalap has been imported into Germany for some time as a cheap source of jalapin; *i.e.,* the resin of jalap insoluble in ether. An examination of this Brazilian root disclosed that it contained over 20 per cent. of resin, which certainly comes up to both the B. P. and U. S. P. requirements for the resin of true or Vera Cruz jalap, but only 0.85 per cent. of the resin is soluble in ether. As a source of jalapin (resin of jalap insoluble in ether) it is therefore twice the value of the Vera Cruz jalap, since it contains twice the standard of resin required by the B. P. While it is a fact that it contains a little more ash than the Vera Cruz jalap, this does not lessen its value as a source of jalapin. (*The Pharmaceutical Journal and Pharmacist,* November 27, 1915, p. 671, by E. M. Holmes.)

PREPARATION OF ETHYL BROMIDE.—Text-book methods for making this chemical are unsatisfactory in the following respects: (*a*) A large excess of alcohol is used, giving a yield of less than 50 per cent. of ethyl bromide on the alcohol used; (*b*) the formation of ether owing to (1) the large excess of alcohol used, and (2) the high temperature used in the reaction; and (*c*) the use of potassium bromide instead of the less expensive sodium bromide. It is suggested that by using (1) molecular proportions by weight of absolute alcohol, sulphuric acid (sp. gr. 1.84), and sodium bromide; (2) water (5 to 10 per cent. of the weight of alcohol taken); (3) excess of sulphuric acid to the extent of 5 per cent. of the theoretical weight required, and paying attention to the rate of heating the reaction mixture, a minimum yield of pure ethyl bromide of 80 per cent. of the theoretical on either the alcohol or the sodium bromide can be obtained. With special care the yield may be increased to 90 per cent. It is possible to obtain these yields without the formation of even a trace of ether, thus obviating loss of time and material in purifying the crude product. (*The Chemist and Druggist,* December 4, 1915, p. 52.)

SCHIMMEL'S REPORT.—Commenting on the recent report issued by this enterprising firm that never seems to forget the scientific aspect of its industry, the *Chemist and Druggist* has this to say: "The report indicates with much satisfaction that the absence of

German supplies is sorely felt in neutral and hostile countries, and in fourteen months foreign competitors of German essential-oil makers have not succeeded in improving their products so as to become serious competitors in the world's markets. A comparison between the prices that have to be paid for essential oils and perfumes on the German and on foreign markets clearly indicates that prices on the latter have reached 'unimaginable heights.' Enemy countries, especially England, try to get German dyes from neutral countries, and the extreme prices that are paid show clearly enough how scarce they are in these countries. The threatenings that have so often been uttered in the hostile press, that after the war Germany will be entirely supplanted by England in the world's markets, need not be taken seriously, at least not with regard to perfumes and essential oils. No ostrich policy can hide the fact from Germany's enemies that a successful trade war against Germany is impossible, notwithstanding the measures that have been taken." (*The Chemist and Druggist,* December 11, 1915, p. 39.)

ESTIMATION OF ATOXYL.—Six different methods for the estimation of the percentage of arsenic in atoxyl are known to chemists. They are (1) sulphurous acid method, (2) the method proposed by Norton and Koch for estimating arsenic in the presence of organic matter in a modified form, (3) the method of the German Pharmacopœia, (4) method of the German Pharmacopœia modified, (5) W. Dulliere's method, (6) Bougealt's hypophosphite method. The authors of this paper give the details of the technic used by them in working out these various methods and the results obtained. All the methods used gave fairly concordant results with the exception of the sixth, which the investigators deem absolutely unreliable. Although nothing new is brought out by the work accomplished by the authors, it was shown that modification of the German Pharmacopœia method gave the best results. (*Journal of A. Ph. A.,* December, 1915, p. 1468, by H. Engelhardt and O. E. Winters.)

TINCTURES.—A number of pharmacopœial tinctures were made from the crude drug and from the dilution of fluidextracts with the end in view of noting if there might be any difference in the stability of each series. While the author seems to make out a good case for diluted fluidextracts, in fact, he even goes so far as to say that the stability of those made from fluidextracts is "fully as good, if not better," we cannot help but feel that a pharmacist who makes his tinctures in such a manner is practising anything but pharmacy.

Why go to all the trouble of acquiring a pharmaceutical education if the end of it all is to be a mere distributer of the products put out by the large manufacturing pharmaceutical houses? (*Journal of the A. Ph. A.,* December, 1915, p. 1472, by Wilbur L. Scoville.)

THE ESTIMATION OF MORPHINE IN PILLS AND TABLETS.—Various compound solvents are given for extracting morphine, all of which can be used with more or less success, but the writer has found that a mixture of one part of alcohol and two of chloroform by volume, as suggested by Williams, can be used with very good results. His method of determining morphine is the transformation of the morphine into an acetyl derivative, extraction with chloroform, and finally titration with standard acid. His method for overcoming the presence of the various diluents used in the manufacture of pills and tablets, in his estimation of morphine, in such dosage forms, is given in detail and is eminently practicable. (*Journal of A. Ph. A.,* December, 1915, p. 1477, by H. W. Jones.)

AUROCANTANE.—This is stated to be a double cyanide of gold and cantharidylethylenediamine, to which the formula $C_{10}H_{12}O_3NCH_3\text{-}C_2H_4NH_2HCN.AuCN + H_2O$ is attributed. It is a white crystalline powder, soluble in alcohol and water, and is stated to be of value in tuberculosis. It is recommended to be given hypodermatically in doses beginning at 25 mg. twice a week, and gradually increased until the patient is getting in the neighborhood of between 50 and 70 mgms. The solution should be sterilized and made so that each mil contains 25 mg. (*J. Pharm. Chim.,* 1915, 12, 323, through the *Pharmaceutical Journal and Pharmacist,* December 18, 1915, p. 761.)

ILLINOIS PURE FOOD LAW UPHELD.—The Supreme Court of the United States has upheld the decision of the Supreme Court of the State of Illinois, which held that the Illinois Pure Food and Drugs Act, which prevents the sale of anything containing "any added poisonous or other deleterious ingredient which may render such article injurious to health," is constitutional. One of the things held to be injurious under this statute is boric acid. A dealer who was convicted of selling a preservative for canned fruit and vegetables which contained boric acid contended that the merchandise sold was not a food and that it had not been proved unwholesome or injurious. The state court very wisely took the view that the law was broad enough to prohibit the sale of any preservative for food that contained boric acid. This decision has just been confirmed by the

Supreme Court of the United States. (*Jour. A. M. A.*, January 22, 1916, p. 282.)

STRONTIUM SALICYLATE.—It is claimed that there is no satisfactory reason for the therapeutic reputation that this salt has enjoyed for so long except the statements of manufacturers. The literature on the pharmacology of this drug is scant. A careful examination of the effects of the drug from a clinical standpoint was undertaken by the writer on a number of cases at the Lakeside Hospital, Cleveland, who summarizes as follows:

1. The mean toxic dose of strontium salicylate is the same as that for sodium salicylate.
2. Strontium salicylate produces the same gastric symptoms produced by any salicylate.
3. It is no more effectual in relief of pain.
4. It is not so convenient to give as are the more soluble salicylates. (*Jour. A. M. A.*, January 29, 1916, p. 332, by M. A. Blankenborn, M.D.)

A PENICILLIUM WHICH PRODUCES OXALIC ACID.—A new *Penicillium* has been discovered that produces oxalic acid from many carbonated media, such as those containing cane-sugar, lactose, potato starch, or peptone. The organism has been named *Penicillium oxalicum,* and is the only mould of the genus *Penicillium* hitherto known to form oxalic acid. It is said that when carbonate of lime is added to the medium the mould grows less vigorously, but the yield of oxalic acid is greatly increased, and it may attain to 40 per cent. of the weight of sugar present. It also is said that the acid is not the end product of the biochemical action of the mould; after from eight to ten days the amount formed reaches a maximum, and then diminishes in quantity. (*Jour. Biolog. Chem.*, Chem. Abstr., 1915, **9**, 3083, J. N. Currie and C. Thom.)

ALIVAL.—A new compound of iodine, organically bound up, is going the rounds under the euphemistic name of Alival! Will the use of coined names never cease? It is supposed to be the result of the action of chlorhydrin on an alkali iodide. It appears as white, silky needles, with a bitter taste, soluble in water, alcohol, and ether, less soluble in benzene and chloroform. Melts at 48° to 49° C. Given in cases in which iodine is indicated. It is claimed that, while the absorption of this drug is less rapid than other combinations of iodine, it is more regular and without untoward effects. (*J. Pharm. Chim.*, 12, 324, 1915.)

CORRESPONDENCE.

Whisky and Brandy in the U. S. Pharmacopœia.

The January meeting of the City of Washington Branch of the American Pharmaceutical Association was held at the National College of Pharmacy on the evening of January 26, 1916.

The need for including whisky in the Pharmacopœia was discussed at some length in connection with the following preamble and resolutions, which, after a free discussion, were unanimously adopted:

Whereas, It is proposed to delete whisky and brandy from the Pharmacopœia of the United States of America, because of the difficulties involved in devising equitable standards and readily applied tests; and

Whereas, The standards and tests heretofore included in the Pharmacopœia did not guarantee an article of unquestioned purity, and

Whereas, It is practically impossible to control, or to determine the purity of whisky and brandy by chemical means alone; and

Whereas, The Government of the United States (for whisky) and the Government of France (for brandy) provide adequate means for securing these products of unquestionable purity and readily controlled quality; now therefore be it

Resolved, That we, the members of the City of Washington Branch of the American Pharmaceutical Association, recommend that American pharmacists who are willing or anxious to supply whisky or brandy of good quality, for medicinal purposes, become acquainted with the existing provisions for securing these products of unquestionable identity and of reasonable purity; and be it further

Resolved, That we, the members of the City of Washington Branch, endorse the proposed deletion of so-called standards for whisky and brandy from the Pharmacopœia of the United States of America.

Mr. Bradbury, in opening the discussion, said it would be interesting to know who really was the instigator of the agitation to include whisky and brandy in the Pharmacopœia. He felt sure that such a move did not come from the legitimate drug trade, as in sections of the country, like the District of Columbia, where druggists were not allowed to sell whisky, the drug trade would be loath to have the responsibility for the sale and distribution of whisky forced back on its hands.

Mr. Richardson said that from his experience prescriptions for whisky are extremely rare and would certainly not warrant the including of whisky or brandy in the Pharmacopœia.

Dr. Harvey W. Wiley reviewed the recent six-year controversy over whisky in the Pharmacopœia, and expressed himself as being heartily in favor of the resolutions as presented. He asserted that the requirements included in the U. S. P. VIII and the requirements, as outlined in a recent number of the *Journal of the American Pharmaceutical Association* (see also this JOURNAL, p. 49), which had been proposed for inclusion in the U. S. P. IX, would not suffice to detect adulterated or sophisticated whisky or brandy.

For the retail druggist who is willing to handle absolutely pure whisky and brandy for medicinal purposes the provisions made by law are ample. Dr. Wiley expressed the belief that the nature of these provisions might be explained so as to point out to well-meaning pharmacists how they might safeguard themselves and their customers. For whisky the double-stamp or bottled-in-bond product is guaranteed by the United States Government to comply with the statement made on the strip label over the cork of the bottle.

While it is true that this label does not in any way guarantee the composition of the original distilled spirits, there are economic reasons for accepting the label as a guarantee of quality.

It would not be likely to pay a distiller to have money tied up in a bonded warehouse unless he were reasonably sure of finding a ready market for his product when it is ready for sale.

For brandy the provisions made by the French Government in connection with the now well-known white certificate or "*Acquite Blanc*" are even more comprehensive. This certificate guarantees a genuine product made from a good quality of wine, and this is, so far as Dr. Wiley knows, the only form of brandy fit for human use. American brandies, so far as known, are vile concoctions made from fermented mixtures of sugar and pomace or the distillation of so-called "sick wines," many of them very sick and unfit for use.

With these additional suggestions as to how the retail druggist can secure a good quality of whisky and brandy, Dr. Wiley thought the resolutions quoted above would be timely and of value to the drug trade, particularly in view of the fact that he had just learned from the Chairman of the U. S. P. Committee of Revision that the proposition to reconsider the vote to delete whisky and brandy had been voted down by a decided majority of the members of the committee, despite the fact that several members who had previously voted for deletion had also voted for reconsideration. This vote, he believes, definitely disposes of whisky in the Pharmacopœia, and the publication of the U. S. P. IX will now proceed unhampered by vexatious questions of policy. S. L. Hilton, *Secretary*.

CORRESPONDENCE COURSE IN HOME SANITATION AND THE PREVENTION OF DISEASES BY THE EXTENSION DIVISION OF THE UNIVERSITY OF CALIFORNIA.

The Bureau of Correspondence Instruction of the University Extension Division of the University of California has just completed the arrangements for giving a correspondence course in Home Sanitation and the Prevention of Disease which is open to the general public. The course is arranged by Dr. Albert Schneider, of the College of Pharmacy of the University of California. It is believed that this course is of special value and interest to pharmacists. It gives instruction as to what is meant by health and disease and how to prevent disease, and is divided into two parts, as follows:

1. The Home and its Environment as Related to Health and Disease. This course deals with the home as the family unit and with such matters as sanitary home building, water supplies, disposal of waste, and the destruction and avoidance of the various carriers of disease. This course consists of fifteen lessons, supplemented by assigned reading in carefully-selected text-books. This is introductory to Course 2, but may also be taken separately.

2. Diseases and Their Prevention. This course treats of communicable diseases (the so-called infectious and contagious diseases), their cause and their prevention. The carriers and the disseminators of disease are discussed, as are also the available means for protecting the home and the individual against the agencies which cause disease. This course also consists of fifteen lessons, supplemented by assigned reading in carefully selected reference works.

The fee for each course is $5. The books required for Course 1 cost $5.41. The books required for Course 2 cost $4.06. The total expense for the two courses, including the required books, is $19. There are regularly assigned lessons which are sent out to the student and which he is required to study diligently in connection with the assigned reading.

Address all communications to University Extension Division, University of California, Berkeley, California.

Dope Law Reduces Sale of Narcotic Drugs 80 Per Cent.

The question as to whether the Legislative Committee of the Pennsylvania Pharmaceutical Association shall have a bill drafted providing for state anti-narcotic regulation to supplement the Harrison federal act and afford still further protection to the public will doubtless come up for discussion at the annual meeting at Reading this year, especially in view of the statements recently made in the newspapers that the number of drug *habitués* has not decreased.

Declarations have been made by the jobbing and manufacturing interests, through whose hands these narcotic drugs originally pass, that the total amount imported and sold has been reduced about 80 per cent.; therefore the conditions referred to must be local and not general.

As the Pennsylvania Pharmaceutical Association was prominently identified with the passage of the Pennsylvania Cocaine Law of 1909, one of the forerunners of the Harrison Act, and has energetically worked for years to aid in the passage of federal legislation, it gives the members much satisfaction to learn from the First Annual Report of the Internal Revenue Commissioner on the administration of the Harrison Act that out of 52,187 druggists registered in the United States under this act, only 216 violations of the law are reported, and most of these were of a technical character and not violations of the spirit of the law.

These figures show that over 99.6 per cent. of pharmacists are found to be complying with a law which, so far as they are concerned, is full of hardships, pitfalls, and arbitrary requirements. For instance, it is perfectly legal and proper to sell over the counter to any customer certain household remedies or medicines containing minute amounts of narcotic drugs too small to become habit-forming and specifically permitted by the exemption clauses of the act, but if a prescription is presented calling for any quantity, however small, of one of these preparations compounded with another medicine, that prescription is subject to all of the restrictions which a really habit-forming prescription calls for and therefore cannot be renewed.

The multitudinous records and reports and the extraordinary care which must attend all handling of narcotic drugs fall with greater force upon pharmacists than upon physicians.

As the primary object of the law is the benefit of the public, and as reports show that this object is being achieved, there is no disposition on the part of pharmacists to do more than protest against such inconsistent rulings as that of Treasury Decision No. 2213, the practical effect of which is explained above. The ruling should either be modified or withdrawn, or else all exemptions should be abolished. As the latter would necessitate the amending of the law itself, it would seem more practical to modify the ruling.

Publicity Committee,
Pennsylvania Pharmaceutical Association.

BOOK REVIEWS.

Supplement to the British Pharmaceutical Codex, 1911, including additions, alterations, and corrections. Published by direction of the Council of the Pharmaceutical Society of Great Britain, London. The Pharmaceutical Press, 17 Bloomsbury Square, W. C., 1915. Price, one shilling net.

This pamphlet of 75 8vo pages contains particulars of important additions and alterations which have become necessary since the work was published, and includes new monographs, galenical formulas, a list of substances with proprietary names and their chemical equivalents, a list of alterations in the text of the British Pharmaceutical Codex, 1911, necessitated by the publication of the British Pharmacopœia, 1914, a list of British Pharmaceutical Codex, 1911, Corrigenda, and an index of nine three-column pages containing upward of 1300 references, and indicating the varied nature and comprehensiveness of the material discussed in the pamphlet under review.

The list of substances with proprietary trade names and their chemical equivalents embodies an attempt to develop and systematize a series of short non-proprietary names by the adoption, so far as possible, of the following rules:

Alkaloids and other basic substances to have names ending in "*-ine.*"

Local anæsthetics, if basic in nature, to have names ending in "*-caine.*"

Antipyretics to have names ending in "*-in.*"

Hypnotics to have names ending in "*-al.*"

Antiseptics, for external use, to have names ending in "*-form.*"

On the basis of this proposed system a number of non-proprietary names have been coined for synthetic chemicals of a proprietary nature. Unfortunately many of these names appear to contain but a remote suggestion to the chemical name or composition of the article, and bear practically no resemblance to the advertised proprietary name by which the article is known or used. The coined non-proprietary name at best will find but limited use, and there may be some reasonable doubt as to the propriety of adding to the existing confusion by coining additional names.

If manufacturers could be induced to follow some reasonable system as the basis for new compounds, much might be accomplished in the way of developing a more rational nomenclature for new remedies of a synthetic nature.

M. I. W.

THE RAT. Reference tables and data for the Albino rat (*Mus norvegicus albinus*) and the Norway rat (*Mus norvegicus*), compiled and edited by Henry H. Donaldson, Philadelphia, 1915.

Dr. Donaldson, Director of the Wistar Institute of Anatomy, has brought together in one of the memoirs of the Wistar Institute of Anatomy and Biology the physical characters of the rat in the form of reference tables and data. This animal possesses many advantages for use in biological work, and has been the subject of much study, particularly by investigators in this country. As a result there has been gathered a considerable number of data applying to the weight and size of the domesticated Albino rat and its parts, as well as some similar data applying to the wild Norway rat, the parent species. It is stated that "the Norway rat (*Mus norvegicus*) is the one mammal now easily obtainable, both wild and as a domesticated form. This latter is represented by either the Albino or the pied rats so common in our laboratories.

"The Albinos are clean, gentle, easily kept and bred, and not expensive to maintain. They are omnivorous, thriving best on table scraps. The span of life is about three years, and breeding begins at three months. Furthermore, the species is cosmopolitan. The litters are large and may be had at any season. The young are immature at birth. The domesticated Albino crosses readily with the wild

Norway. The rat, both wild and domesticated, takes exercise voluntarily, and is susceptible to training. It is also highly resistant to the usual wound-infecting organisms. For a number of lines of study, therefore, the rat seems to be a peculiarly suitable animal."

The observations presented in the tables have been made mainly on rats in the first year of life, and the data, therefore, applied to the rat in its most vigorous period. "Since the quantitative data appearing in the tables are biological, they naturally exhibit more or less variability and reflect in each instance something of the conditions under which they have been obtained. It follows, therefore, that they must not be expected to possess the precision of physical or chemical determinations. Nevertheless, so long as the values here presented are not mistaken for absolute standards representing ideal or final determinations, they may be used with advantage."

In the physiological standardization of drugs the experiments are usually performed on the frog, the guinea-pig, and the cat. It is very doubtful if the experimenters have access to fundamental data and tables such as are presented here on the rat. There will continue to be wide discrepancies among different experimenters on various animals until tables based on formulas for these several animals have been computed. These will require a vast amount of time, and it is doubtful if the researches are as extensive or as carefully worked out as those on the rat. This work of Dr. Donaldson is deserving of the careful study of all those engaged in the practical testing of drugs on animals. It is, furthermore, quite likely that for constancy of results the rat will supersede all the other animals which have been used. This is probable because, in the use of the formulas of Dr. Donaldson, it is possible to obtain values of precision for the results obtained. H. K.

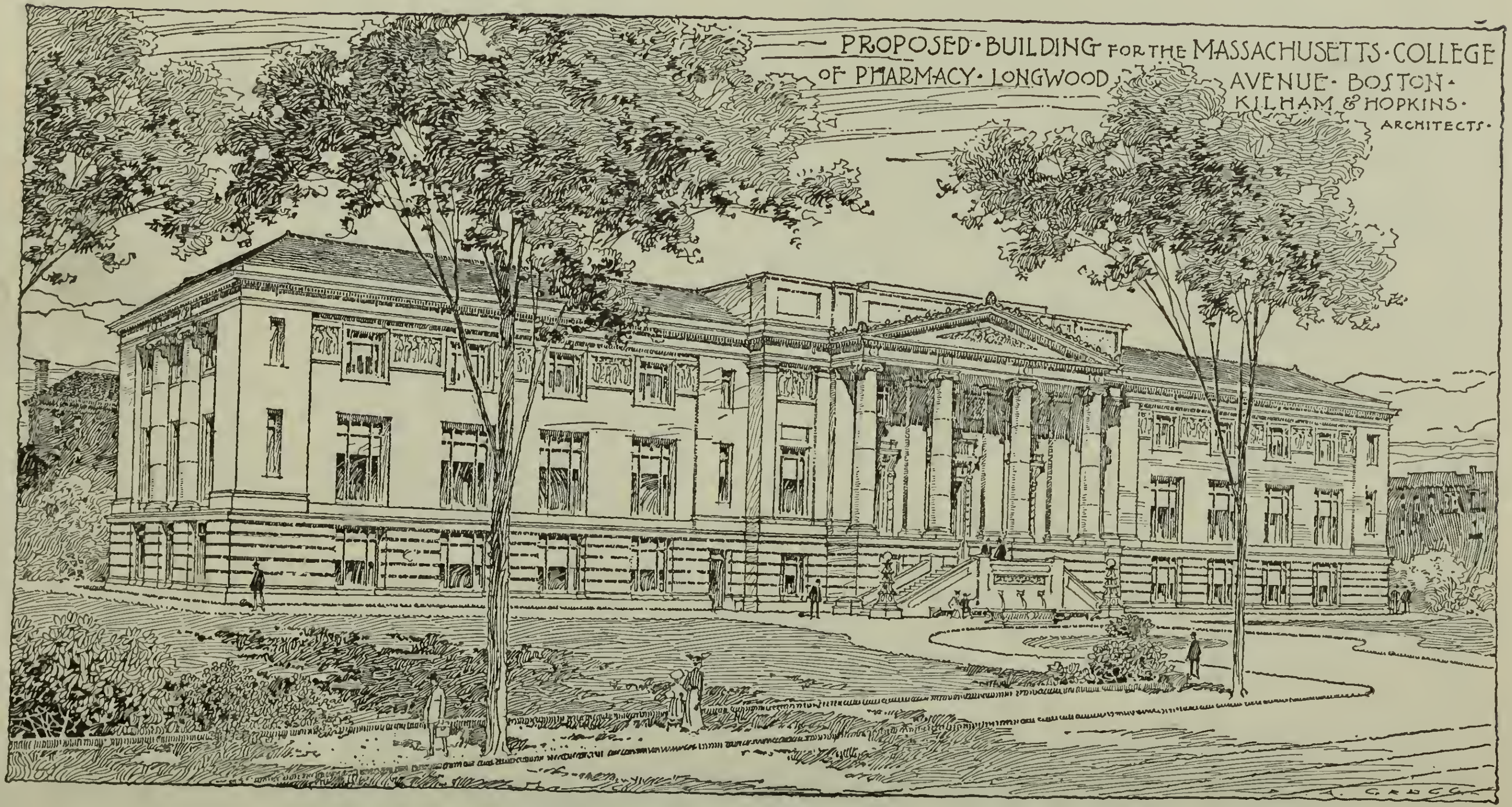
EDITORIAL.

Massachusetts College of Pharmacy.

It is cause of great satisfaction to learn that the Massachusetts College of Pharmacy is actively planning for a new building, which will be located very near the new buildings of the Harvard Medical

School in Boston. The Massachusetts College of Pharmacy is in possession of an endowment of $240,000, made up of donations and legacies given to the college at various times. It is doubly gratifying to note that these funds have never been required to maintain the institution, and that they constitute the permanent endowment of the college. Every one interested in educational work will felicitate the college and look forward anxiously to the results of its work. Professional education is always expensive, and no institution of to-day can maintain itself solely by the fees received from students. The actual cost of teaching varies from two to ten times that paid by the students in fees. This fact alone should cause the alumni of every institution to return to their Alma Mater, in the form of donations and bequests, the difference it cost to educate them. With some of the anxiety and worry removed in connection with the financial support of the institution, the faculty of the Massachusetts College can concentrate its attention to the educational problems which will confront our profession in the future. This college has great opportunities and should become a model institution, both in its curriculum and character of graduates. We hope that the college will not take up new theories, but will aim to develop the best type of professional pharmacists, the graduates of whom will favorably compare with those of medicine of the Harvard Medical School, in which atmosphere this college will develop. We have no doubt that the faculty of the Massachusetts College will rise to their opportunities and fulfil their trust with credit to themselves and due concern to the wishes of the donors and those interested in the development of pharmacy. We are fortunate in being able to show a perspective drawing of the proposed building for the Massachusetts College of Pharmacy. Furthermore, as very great interest in this college will naturally be aroused, it would seem well to publish a historical sketch of the college since its foundation in 1823.

The preparation and the publication, in 1820, of the first United States Pharmacopœia necessarily caused an increased interest among physicians and apothecaries in pharmaceutical science. In 1822 a committee was appointed, in Boston, to draft a constitution and by-laws for a pharmaceutical association. The report of this committee, made in December, 1822, was adopted at the formal institution of the Massachusetts College of Pharmacy, in February, 1823.


PROPOSED · BUILDING FOR THE MASSACHUSETTS · COLLEGE
OF PHARMACY · LONGWOOD AVENUE · BOSTON ·
KILHAM & HOPKINS ·
ARCHITECTS ·

Perspective drawing of a new building planned for the Massachusetts College of Pharmacy.

The objects of this organization were: to provide the means of systematic education, to regulate the instruction of apprentices, to promote a spirit of pharmaceutical investigation and to diffuse information among the members, to discountenance the sale of spurious and inferior articles, to regulate the business as far as practicable and consistent with social institutions, to cherish habits of friendly intercourse, and, in general, to advance the character and interests of the profession.

Meetings of the college were held semi-annually at first, and then quarterly, and appropriations were made for the library and for cabinets, and the collection of books and of specimens was begun. Efforts were made to establish a course of instruction for apprentices, and much attention was given to the subject of uniform prices in the stores. The college continued to exist along these lines until it was thoroughly reorganized, in 1851, with a membership composed about equally of old and of new members. The constitution and by-laws were revised, and pharmaceutical meetings, especially devoted to scientific purposes, were appointed for each month. In February, 1852, the college petitioned the General Court for an act of incorporation, which was secured on April 3, 1852; in February, 1876, it was amended and indefinitely extended, and it was again amended in 1881, in 1888, and in 1913.

Courses of lectures on chemistry were delivered during the winter of 1853 by Charles T. Jackson, M.D., and during the following winter by Professor J. P. Cooke, Jr., of Harvard College. These lectures were especially prepared with reference to the needs of pharmacists. During the winter of 1858–59, Mr. Charles T. Carney gave a course of six lectures on pharmaceutical chemistry. These courses of lectures were delivered before the members of the college and were attended by but few of the clerks.

In the spring of 1867 the Board of Trustees authorized a committee to ascertain if a sufficient number of young men employed in Boston drug stores could be enrolled to warrant the formation of a class. They invited all eligible to meet at the college rooms, where, on March 27, about twenty responded to the call, and were formed into a class by Mr. Markoe, who inaugurated a course of nine free lectures on practical pharmacy. This informal beginning promised so well that the college resolved to establish a permanent school of pharmacy, and secured as lecturers Messrs. Cyrus M. Tracy, upon materia medica and botany; E. L. Stoddard, Ph.D., upon chemistry, and George F. H. Markoe, upon pharmacy.

During the first session of the school the course in chemistry was given in the building of the Massachusetts Institute of Technology, Prof. F. H. Storer assisting in organizing this course, while the other two courses were given at the college rooms, on Temple Place. The class numbered thirty-five students.

In October, 1868, the lecturers of the first session were appointed professors for 1868–69, and all the lectures were given at No. 8 Boylston Street, where the school continued till the session of 1876–77, when it removed to the Mayhew School building, on Hawkins Street. Here it was burned out, on January 23, 1877, and the rest of that session was held at the Massachusetts Institute of Technology. In 1878 the college occupied the old Franklin School building, on Washington Street, where it continued its work until October, 1886 when it removed to its present building, which was constructed for its special use.

Since the early days of the college the original courses have been improved and developed and others added, until now the required work of the regular course comprises two years of each of these subjects: general chemistry, botany and materia medica, analytical chemistry, and theoretical and applied pharmacy, and one year each of arithmetic, Latin, and organic chemistry. There is also a post-graduate year with courses in commercial pharmacy, bacteriology, advanced materia medica and microscopy, and advanced analytical chemistry and urine analysis.

The attendance at the college has increased until now there are nearly three hundred students, and the present building, erected in 1886, is crowded to the extreme limit of its capacity. The need of a new building has become absolutely imperative. Anticipating this need, the college, in 1912, purchased a fine site at the corner of Brookline and Longwood Avenues, Boston, in the district which has become, during the last decade, one of the largest medical centres in the country. In this neighborhood are now located the Harvard Medical School (with its four-million-dollar group of white marble buildings), the Brigham Hospitals, the Children's and Infants' Hospitals, the Huntington Cancer Hospital, the Deaconess' Hospital, the Angell Animal Hospital, Harvard Dental School, Tufts Medical and Dental Schools, the Carnegie Nutrition Laboratory, and other institutions of a similar character.

During 1915 the Trustees chose Kilham and Hopkins, of Boston, an architectural firm which has designed many educational buildings, to prepare preliminary plans and sketches for a college building for this new site. The architects have worked out very cleverly the suggestions given them as to the number and location of rooms, etc., the floor plans giving as much general satisfaction as does the beautiful and imposing exterior. The building has a frontage of 230 feet, and will face on Longwood Avenue. As the lot contains about 60,000 square feet, there will be plenty of room for lawns and planting, to give the building its proper setting, and its impressive character will add much, in the eyes of the general public, to the dignity of the profession of pharmacy.

The first floor is to be at ground level, and will contain the chemistry and pharmacy laboratories, with apparatus rooms and instructors' rooms, a large study for men students, and also the heating plant and janitor's workshop, and the stack-room of the library. The middle or main floor will contain two lecture rooms, each with about three hundred seats, the Trustees' room, general offices, library, women's study, and rooms for the professors. The upper floor will contain the materia medica laboratory, with its stock-room, the bacteriology laboratory, recitation rooms, alumni room, and other rooms of varying size and importance, besides a large assembly room (in the central portion of the building) with a capacity of five hundred seats, a stage at one end, and store-rooms and retiring rooms adjoining. This assembly hall may be used for conventions, receptions, and other social purposes, and for the commencement exercises of the college.

The proposed building, with its equipment, exclusive of its site, will cost in the neighborhood of $200,000. A part of this will be obtained by the sale of the present building and its site, and a part is being raised by a campaign now under way. It may be necessary to put a mortgage on the building for a part of its cost, but it is hoped that this will be small in amount.

Since 1872, when Mr. Charles French, of Boston, left $2000 to the college, a number of donations and legacies have been received, varying in amounts from $200 to about $200,000. These funds are held by the Trustees of Funds (a special board appointed to care for them), the investments being restricted by the college by-laws to such securities as are legal for the savings banks of Massachusetts. These funds amount now to about $240,000, and constitute the permanent endowment of the college, of which only the income is used.

PHILADELPHIA DRUG EXCHANGE.

ANNUAL MEETING.

The fifty-fifth annual meeting of the Philadelphia Drug Exchange was held in the afternoon of January 25, 1916, in its rooms at the Bourse. The occasion was featured by a reception to Dr. Eugene G. Eberle, formerly of Dallas, Texas, editor of the *Journal of the American Pharmaceutical Association,* the office of which is now located in the rooms of the Drug Exchange.

The election of officers resulted as follows: President, John Fergusson; vice-president, Harry B. French; secretary, Joseph W. England; treasurer, Anthony M. Hance; directors, Charles E. Hires, A. Robinson McIlvaine, Dr. Adolph W. Miller, Adam Pfromm, Adolph G. Rosengarten, Clayton F. Shoemaker, Richard M. Shoemaker, and Walter V. Smith.

The annual report of the Board of Directors was read. It gave a comprehensive review of the general business conditions of the country during 1915, and referred to the drug trade, as follows:

"When we consider the position of the wholesale drug trade during these months, we face an entirely different set of conditions. One year ago, the first excitement arising from the war had largely subsided, and prices of foreign goods, as a rule, were gradually declining. Early in the year, however, the embargo placed by the German Government upon exports of chemicals and dyestuffs completely changed market conditions, and since that time the prices for German chemicals have been steadily advancing, until at the present time a few articles cannot be furnished at all, with the prospect that this list will be added to materially as time goes on. It has been a great hardship to many that large stocks of goods which were purchased and paid for by citizens of this country before the date of the embargo have not been permitted to be shipped by the English Government, notwithstanding its promise to do so. Likewise it was thought that during the year the prices of goods from the Far East would be materially reduced. They had been extremely low because of the restriction of their markets, and it was thought that this condition would operate to bring prices still lower. Recently, however, the activities of submarines in the Mediterranean Sea have been so great that, added to the scarcity of ships, the result has been that the prices of goods from the East Indies, China, and Japan have been tremendously advanced.

"The Harrison Narcotic Law has now been in force for nearly a year, and is generally conceded to have worked successfully. It has been estimated that the sale of narcotics in the ordinary channels of trade has been reduced about 80 per cent. There have been some minor violations, but these are being carefully looked after in most cases by the U. S. Government officials, and there seems to be a general satisfaction with the law and its enforcement.

"The Special Stamp Act, passed by Congress about a year ago, and which was to have expired on December 31, was extended for another year, by the joint action of both Houses, and signed by the President, so that it is now a law. This was not accomplished without a spirited discussion, but in view of the financial condition of the government it was only to be expected. This law bears oppressively upon the drug trade, and we should miss no opportunity to express our disapproval of it.

"Another matter which is deeply interesting to the wholesale drug trade and our friends, the manufacturers of proprietary medicines, has been the war declared upon the latter by the New York City Board of Health. This body, acting upon the authorization of the Legislature of the state of New York, some months ago passed a rule requiring that all proprietary remedies must bear upon their labels the names of the active medicinal ingredients contained therein, or that these names must be filed with the Board of Health in advance of January 1. Proprietary manufacturers regarded this action as a confiscation of their property, without compensation, and have determined upon active and bitter opposition. Three applications were recently made by different houses, representing different lines, for a preliminary injunction to prevent the Board of Health from carrying out their plan. These applications will be heard in a few days. In the meantime, laws of this kind have been passed in three states of the Union, but up to this time have not been enforced.

"So far as our own state is concerned, your Committee on Legislation had a period of considerable activity. We used our efforts to help defeat three measures, especially, which we regarded as highly detrimental to our line of business.

"The first was a bill providing that all disinfectants must bear on their label the carbolic coefficient percentage. As this can only be applied to disinfectants of a certain class, it would virtually have prevented the use of formaldehyde, either alone or in combinations, and likewise of other valuable forms of disinfectants.

"Another bill which was defeated provided for a patent medicine labelling clause, similar to the one which is now being so bitterly fought in New York City.

"A third was a bill providing that insecticides and fungicides must bear a formula for their ingredients on the label, and this was subject to the same objections as the Patent Medicine Labelling Bill.

"There were likewise several pharmacy bills introduced, but none of them were passed, and in this connection we let it be distinctly understood that we do not look with favor upon the passage in this state of a narcotic law which differs in its provisions from the national law.

"In addition to this legislative work, your Board took action in a number of other matters which are important to our line of business, and among our other activities we heartily endorsed the principles of the Stevens Price Protecting Bill. This bill gives the manufacturers of branded goods the legal right to make contracts for the maintenance of the re-sale price of such goods. Under the law as it stands now, the manufacturer may brand his goods, but he has no legal right to fix their re-sale price and protect himself against predatory cutting. While the primary effect of price-cutting on branded goods may be of benefit temporarily to the public, the secondary effect is inexcusable injury to the public, due to substitution of cheaper and inferior goods and the elimination of the branded goods.

"In this connection it is also interesting to note that a few months ago Judge Hough, in the U. S. District Court of New York, decided in the Cream of Wheat case that the manufacturer of an article has an unquestioned legal right to refuse to sell his goods to any buyer, for any reason, however capricious, and this decision was later confirmed by the U. S. Circuit Court of the District.

"As we stand to-day and look towards the future, there are some things plainly evident to which we wish to call your attention. The past year, owing to the sensational character of business, has afforded opportunities for a rather better profit than usually obtains in our line. During a period of rapid and unexpected changes the shrewd business man generally secures a better profit than he does during periods of steady prices; at the same time, we must all bear in mind that some of these days the war will end and that the prices which have so largely advanced will be largely reduced. We must be prepared for radical changes in prices, in volume, and in competition, and we should not allow ourselves to be overconfident, or our business overextended.

"One of the usual features of our annual report is absent this year, and that is the list of deceased members. On going over our records we do not seem to find that any member of this association has died during the year. It will thus be seen that membership in the Philadelphia Drug Exchange is a valuable asset. It brings with it a sense of duty well performed and a feeling of comfort which tends to longevity.

"In conclusion, your Board of Directors again wish to remind you of the work which is constantly being done by your officers in your behalf. We feel that last year, especially along the lines indicated, we were especially helpful. This service is gladly and cheerfully performed, the only desire on the part of your officers being to make the work of the association as effective as possible. No opportunity should be neglected to inform others of the value of the Philadelphia Drug Exchange as a working base, from which, in case of need, definite action may be promptly and judiciously taken. It frequently happens that new members may be obtained by proper effort at the proper time, and the importance of this is urgently recommended to you."

ANNUAL DINNER.

With more than 150 members and guests participating, the annual dinner of the Philadelphia Drug Exchange, the evening of January 28, 1916, was unquestionably the best attended and the most enjoyable in the history of that time-honored organization. It was a fitting celebration of the era of prosperity through which, as indicated in the various addresses, these immense interests, representative of the drug, chemical and allied industries, are passing. It took place in the Ritz-Carlton Hotel.

Following a policy of many years' standing, the speakers for the most part avoided more than passing references to the business of the men whom they were addressing. But two stirring addresses on preparedness commanded breathless attention, and were followed by so enthusiastic applause as to leave no doubt of the good red blood and the intense patriotism of these captains of industry in the membership of the Drug Exchange.

An informal reception preceded the dinner and brought together the many visitors from New York, Baltimore, Trenton, and other adjacent cities, as well as the older and the younger men in the local drug trade—the latter the débutantes in the trade; for with the manufacturing and wholesale drug and chemical interests in Philadelphia, one is really not considered properly affiliated until he has attended a Drug Exchange banquet. Then his standing from a sentimental standpoint at least is assured. And on the evening of the dinner there were scores of these younger men, ready to succeed to the responsibilities of their fathers as the latter gradually pass them along to more youthful shoulders.

Shortly after 7 o'clock Chairman Walter V. Smith, of the Entertainment Committee, gave the signal and the guests were ushered into the banquet hall. Formality was observed only at the officers' table, about which were grouped the officers of the exchange and their guests. At a score of smaller tables the members were seated, without special arrangements, for the committee was of the opinion that such a plan favored more of informality than the seating at separate tables of the representatives of any one firm or corporation.

Led by professional singers, between courses the diners joined in the popular airs with a freedom that indicated that the cares of business had no part in a Drug Exchange dinner. Although a strictly dry dinner, it did seem to the close observer that the greatest harmony and enthusiastic volume prevailed in the rendition of "The Stein Song," which every one seemed to know and enjoy so well that it was repeated several times.

It was on the stroke of 9 o'clock that President John Fergusson, in his capacity of toastmaster, rapped for order and then impressively expressed the pleasure of the officers of the Drug Exchange in having this unusually large gathering of its friends at the annual function. He referred briefly to the great activity of affairs in the drug, chemical and allied trades during the past year. Then he mentioned the coming to Philadelphia of the *Journal of the American Pharmaceutical Association,* and that, upon the invitation of the Drug Exchange, its home would be in the offices of that organization in the Bourse.

He then introduced the first speaker, Dr. Eugene G. Eberle, its editor, declaring that "he seems to be the most popular man in the drug trade to-day."

In a most interesting manner Dr. Eberle reviewed the more than half-century of the association's existence and mentioned the names of some of the Philadelphians who had been identified with these earlier events and their altruistic efforts that had reverted so advantageously to the pharmacists of to-day. Many of the problems that confronted the leaders in pharmacy and chemistry in those days, he said, were now easy for the student at college. He made a strong plea for closer coöperation between the universities, the colleges, and schools where pharmacy is taught, and the commercial interests in pharmacy and chemistry. He showed that those educational institutions should not be solely dependent upon the pupils for their incomes, but that wealthy men who realized the particular value of such institutions should come forward and provide for their greater effectiveness with endowment funds. The speaker closed with a pledge of coöperation on the part of the *Journal,* and expressed the hope that his friends among the members of the exchange would help him to make the *Journal* serve in a broader way, if possible, the aims and policies of the association and the interests of pharmacy in general.

In the person of Leroy Oldham, the Baltimore Drug Exchange sent a most able representative. He mentioned the pleasure of the members of that organization in having Harry B. French, the vice-president of the Philadelphia Drug Exchange, at its annual meeting a year ago, and then, in true Southern fashion, welcomed the Philadelphians and their guests at any time to Baltimore and the home of the Exchange. Mr. Oldham then delighted his audience with incidents showing the characteristics of the old negro "mammy" and "uncle," many of which had occurred in his own boyhood days.

And then the guests were brought face to face with the grave conditions that confront them as business men of the United States when former Congressman Reuben O. Moon, a member of the Philadelphia Bar, pointed out the dangers of the policy of preparedness. He showed how after centuries spent in perfecting the world's civilization it had been proved to be but a veneer that had been swept aside by the nations of Europe in their return to barbarism. The great defect in that civilization had been the worship of effectiveness. He showed that the great danger of military preparedness was in being swept over the line through a knowledge of its existence.

" You business men are really the potent factors in these situations," he declared, " and you are the men who will finally solve these problems. The politicians now and then rise above you in their seeming command of the situation, but it is men like you and organizations like the Philadelphia Drug Exchange that are the real factors. I beg of you, guard against this danger of being swept over the line just as the nations of Europe have done, through military preparedness."

In strong contrast to the conservative views of Mr. Moon were those of the next speaker, the Rev. Robert Johnston, rector of the Church of the Saviour. He explained that he had intended to speak in lighter vein, but that he could not, after hearing the address of the preceding speaker.

A native of Great Britain, but now a citizen of the United States, with an intensity that was keenly felt by his hearers, Dr. Johnston told how he was proud and happy in the country of his adoption, but that he wanted to feel that if the time came he could receive the protection that he had been promised under the Stars and Stripes.

" I don't believe in the danger of militarism," he declared, " but I do believe in the effect upon others of being prepared on general principles to maintain our dignity and our position."

In his opinion the time is not far distant when the United States must show that it is prepared to back up its position in order to have other nations give proper consideration to its demands. " The way to offset the impression of a battleship is with two battleships," he said in closing. " Surround our great coast lines with a wall of steel. When we can keep foreign soldiers off our shores, we won't need much of an army to kill them off."

In close keeping with the subjects discussed by Messrs. Moon and Johnston was the description of the recent trip of the Liberty Bell from Philadelphia to San Francisco, given by Councilman Joseph P. Gaffney, a member of the committee which accompanied this revered relic from this city. Stereopticon views showed how the patriotism of the entire country had been stirred by the sight of the old bell that had proclaimed the freedom of the American people so many years ago. They supplemented the words of the lecturer, who declared that apparently those people stood ready now as they did then to resent any foreign encroachment.

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THE PHARMACIST AS THE FUTURE MUNICIPAL CHEMIST AND BACTERIOLOGIST.

By C. FERDINAND NELSON, Associate Professor of Physiological Chemistry, University of Kansas, School of Pharmacy.

Among the many brilliant achievements of the nineteenth century, the development of the sciences of chemistry and bacteriology is by no means least. Especially noteworthy from a practical point of view have been the adaptations by means of countless methods and procedures of the data of these sciences so that we now have within them separate and distinct departments of endeavor, whose sole concern lies in the application of chemical and bacteriological methods to the problems of daily life. In the industries and in business we find a decided trend toward the adoption of definite checks on the purity, composition, value, and reliability of raw and finished products, and these checks are largely chemical or bacteriological in nature. In the practice of medicine physicians are increasingly desirous of having their diagnoses verified by chemical and bacteriological analyses. In sanitary and public health work bacteriological and chemical methods have become indispensable.

I think it perfectly safe to say that there exists to-day a vast latent demand for the services of men and women having chemical and bacteriological training, particularly those who possess also some business ability. *Now why should the pharmacist not use his chemical information in some definite and constructive way—why should he forget that he has learned something besides the Latin name for tincture of ginger, whisky, poke-root, and how to compound a prescription containing, say, sodium chloride, boric acid, and camphor water? If that is all there is to the profession of pharmacy, there is no glory in it and we have no business to recommend it to the bright young man of to-morrow.*

But it is not alone in private business that this desire of being able to obtain chemical and bacteriological data is felt. Our municipalities are becoming interested in the question. As public corporations they need to avail themselves of modern methods. The health officer needs the services of a chemist and bacteriologist. The community milk supply needs to be watched and the milk subjected to frequent analysis. The water supply should be examined and samples of water analyzed at regular intervals. Infected areas can be easily determined and controlled where bacteriological data can easily be had. Sewage disposal can be safeguarded. In short, in order to adequately protect the public health, it becomes almost imperative that laboratories, where chemical and bacteriological analyses can be made, be established in each municipality.

Now it is precisely here where the pharmacist can be of service to his community, can elevate his calling, can check the inroads which commercialism has made in his profession, and at the same time open up a field yielding him splendid financial returns. *The civic laboratory is bound to come, for the city, for the town, even for the village.* The pharmacist is already established in all of these communities; he has his stock of chemicals, his store, his technical education. Why is he not the very man to run for the office of city chemist and bacteriologist? Why should he not step in and help the physician preserve the public health? Why should he not speak as authoritatively on matters chemical and bacteriological as the average physician now does on sanitation, infection, and the other numerous phases of public health work?

The progressive pharmacist should anticipate these opportunities; he should prepare and equip himself for the demands of the future, and not sit idly by and have things slip out of his hands, literally go by default. *When it comes to professional matters, we have more inertia than a ten-ton bowlder. What about our professional momentum and energy?* A bacteriological and chemical outfit, aside from what a pharmacist already has in his store, will cost him less than $500. Ten feet of space in the front part of the store fitted up as a neat laboratory far surpasses a soda fountain as an advertising medium. If he spends as much energy developing a department of this sort as he frequently does in selling sundries, his returns for analyses other than those done for the municipality will yield him far greater revenues.

A METRICAL TRAGEDY.*

By Dr. Jos. V. Collins, Stevens Point, Wis.

The war in Europe has opened up a large field of trade in South America. Three things especially stand in the way of its development, viz., the absence of a proper credit system, the failure to make goods of the kind demanded, and, third, the use of our antiquated system of weights and measures, all the South American countries employing the metric system. Of these three obstructing influences, the first two are in a fair way to be obviated soon; not so the last.

It is the use by our modern progressive country of an ancient system of weights and measures which it is here proposed to discuss and show up as an absurdity. Our present system is organized and set forth in arithmetics under some fifteen so-called "tables." These tables are all different and there is no uniformity in any one table. Only one unit suggests convenience in reductions, viz., hundredweight. It is easy to reduce from pounds to hundredweight and *vice versa*. Some fifty ratio numbers have to be memorized or calculated from other memorized numbers to make the common needed reductions. History shows that ancient Babylonia had tables superior to those now in use, and ancient Britain a decimal scale which was crowded out by our present system.

The metric system of weights and measures was developed in France about 1800 and has come to be employed over all the civilized world except in the United States, Great Britain and Russia. The system was legalized in the United States in 1866 but not made mandatory, and here we are fifty years later using the old system, with most of the civilized world looking on us with more or less scorn because of our belatedness.

In this age everywhere the cry is efficiency, always more efficiency. Ten thousand improvements and labor-saving devices are introduced every day. But here is an improvement and labor-saving device which would affect the life of every person in the land and in many instances greatly affect such persons' lives, and yet almost no one really knows anything about the matter.

So let us now consider the good points in the metric system (each implying corresponding elements of great weakness in the common system), and then study briefly what stands in the way of its adoption in this country. These good points are:

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* *The Scientific Monthly*, vol. i, No. 3, 1915, p. 256.

First, the metric units have uniform self-defining names (cent, mill, metre and five more out of the eleven terms used already familiar to us in English words), are always the same in all lands, known everywhere, and fixed with scientific accuracy.

Second, every *reduction* is made almost instantaneously by merely moving the decimal point. There are no reductions performed by multiplying by 1,728 or 5,280, etc., or dividing by 5½, 30¼ or 31½, etc., and hence there is *a great saving* in the labor and time of making necessary calculations.

Third, there are but *five* tables in the metric system proper, these taking the place of from twelve to fifteen in our system (or lack of it). These are linear, square, cubic, capacity and weight.

Fourth, any one table is about as easy to learn as our United States money table, and after one is learned, it is much easier to learn the others, since the same prefixes with the same meanings are used in all.

Fifth, the weights of all objects are either known directly from their size, or can be very quickly found from their specific gravities.

Sixth, the subject is made so much easier for children in school that a conservative expert estimate of the saving is two-thirds of a year in a child's school life. The rule in this country is eight years of arithmetic, the arithmetic occupying about one-fourth of the child's activity. With metric arithmetic substituted for ours, what it now takes two years to prepare for, could be easily done in 1⅓ years. This involves an enormous waste of money and energy every twelvemonth.

Seventh, only *one* set of measures and *one* set of weights are needed to measure and weigh everything, and *one* set of machines to make things for the world's use. There would be no duplication of costly machinery to enter the foreign trade field, thus securing enormous saving. It is well known that the United States and Great Britain have lost a vast amount of foreign commerce in competition with Germany and France, because of their non-use of the metric units. Britain realizes this and is greatly concerned over the situation.

Eighth, every ordinary practical problem can be solved conveniently on an adding machine. Our adding machines are used almost solely for United States money problems.

Ninth, no valuable time is lost in making reductions from common to metric units, or *vice versa,* either by ourselves or foreigners. To make our sizes in manufactured goods concrete to them foreign customers have to reduce our measures to theirs, and this is a weariness to the flesh.

Tenth, the metric system is wonderfully simple. All the tables with a rule to make all possible reductions can be put on a postal-card.[1]

The metric weights and measures constitute *a scientific system;* our weights and measures are a *disorganization.* Naturally one can expect a *great saving of time, thought and labor* from the use of a system, and this is the fact. If one dared introduce ordinary arithmetical problems into an article like this, it would be easy to show by examples how a person has to be something of a master of common fractions in order to solve in our system common every-day problems, whereas in the metric system nearly everything is done very simply with decimals. In our system a mechanic after making a complicated calculation with common fractions is as likely as not to get his result in sixths or ninths, etc., of an inch, whereas his rule reads to eighths or sixteenths, and he must reduce his sixths or ninths to eighths or sixteenths before he can measure off his result. In the metric system results always come out in units of the scale used. The metric system measures to millimetres or to a unit a trifle larger than a thirty-second of an inch. In our system one is likely to avoid sixteenths or thirty-seconds on account of the labor of calculation. Then, besides, the amount of figuring is so much less in the metric system. Take the case of a certain problem to find the cubical contents of a box. Our solution calls for 80 figures and the metric for 35, and this is a typical case, not one specially selected. Thus, metric calculations, while only from one-third to two-thirds as long, are likely to be two or three times as accurate, are far easier to understand, and the results can be immediately measured off. Hence, we waste time in these four ways. Shakespeare, in *Hamlet,* says: " Thus conscience does make cowards of us all." In like vein it might be said: Thus custom (in weights and measures) doth make April fools of us all. It is no exaggeration to say that counting grown-ups solving actual problems and children solving problems in school we are sent on much more than a billion such April fool errands round Robin Hood's barn every year.

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[1] See article by the writer in *Education* (Boston), Dec., 1894.

Noting how much time is saved in making simple everyday calculations by using the metric system, suppose that we assume of the 60 or more millions of adults in active life in this country, on the average only one in 60 makes such calculations daily and that only twenty minutes' time is saved each day. Let us suppose that the value of the time of the users is put at $2.40 per day, or 10 cents for 20 minutes. Then 1,000,000 users would save $100,000 per day, or $30,000,000 per year. But perhaps some one is saying that much of this time is not really saved, since many persons are paid for their time and can just as well do this work as not. The answer to this is that in many instances such calculations take the time of *others* as well as the person making the calculation. Occasionally a contractor might hold back or work to a disadvantage a gang of a score of workmen while trying to solve a problem that came up unexpectedly.

An estimate of the value of all weighing and measuring instruments places the sum at $150,000,000. Thus, we see that in five years, merely by a saving in *time*—for time is money—all metric measuring and weighing instruments could be got *new* at no extra expense. This estimate of the cost of replacing our weighing and measuring instruments by new metric ones and of saving time has been made by others with a similar result.

A matter of very much more importance than that just discussed is the extra unnecessary expense put upon education, viz., two-thirds of a year for every child in the land. Presumably if the metric system were in use with us, all our children would stay in school as long as they now do, thus getting two-thirds of a year farther along in the course of study. Actually, if arithmetic were made more simple, vast numbers would stay longer, since they would not be driven out of school by the terrible inroads on their interest in school work by dull and to them impossible arithmetic. If metric arithmetic texts were substituted for our present texts, it is safe to say children would average one full year more of education. What the increased earning power would be from this it would be hard to estimate, but clearly it would be a huge sum.

Consider also how much more life would be worth living for children, teachers and parents if a very large portion of arithmetical puzzles inserted to qualify the children to understand our crazy weights and measures were cut out of our text-books. If we were to adopt the metric system, literally millions of parents would be spared worry, and shame, and fear lest Johnny fail and drop out of school, or Mary show unexpected weakness and have to take a grade over again; uncounted thousands of teachers would be saved much gnashing of teeth and uttering of mild feminine imprecations under their breath; and, best of all, the children themselves would be saved from pencil-biting, tears, worries, heartburns, arrested development, shame and loss of education!

A committee of the National Educational Association has recently reported that Germany and France are each two full years ahead of us in educational achievement; that is, children in those countries of a certain age have as good an education as our children who are two years the foreign children's seniors. Surely one of these years is fully accounted for by the inferiority of our American *arithmetic* and *spelling*. This much, at least, of the difference is neither in the children themselves, nor in the lack of preparation of our teachers, nor in educational methods.

Professor J. W. A. Young, of the University of Chicago, in his work on "Mathematics in Prussia," says: "In the work in mathematics done in the nine years from the age of nine on, we Americans accomplish no more than the Prussians, while we give to the work seven-fourths of the time the Germans give." Professor James Pierpont, of Yale, writing in the *Bulletin* of the American Mathematical Society (April, 1900), shows a like comparison can be made with French instruction. Pierpont's table exhibits only one hour a week needed for arithmetic for pupils aged 11 and 12! As the advertisements sometimes say, there must be a reason.

But if the children are kept in school two-thirds of a year longer somebody pays for this extra expense. Now children do not drop out of school until they are about 12 years of age and have both appetites and earning power. The number of these children that drop each year is probably about 2½ millions. Of this number let us say 1½ millions would become wage earners, thus passing from the class that are supported to the class that support themselves and earn a small wage besides. We have then three items in this count: (1) The cost to the state in taxes for the education of 2½ millions for two-thirds of a year, or $50,000,000; (2) the cost to the parents for support of 1½ millions for two-thirds of a year at $67 each, or $100,000,000; (3) the wages of 1½ millions over and above the cost of their support, say $50 each, or $75,000,000.

The above figures are put low purposely so that they cannot be criticised. It should be remembered that 46 per cent. of our population is agricultural, and that on the farm, youths of from 13 to 15 very often do men's and women's work; also that in many manufacturing centres great numbers of children get work at relatively good wages, and that the number of completely idle children out of school is not large.

With these figures in hand let us consider now a kind of debit and credit sheet against and for our present system of weights and measures.

Present System of Weights and Measures.

In *annual* account with Uncle Sam

Dr.		Cr.
To cost in school taxes of keeping 2½ millions of children in school ⅔ year	$50,000,000	By culture (?) acquired by the children through learning more common fractions and our crazy tables of weights and measures ....$?
To cost to parents for supporting 1½ million children ⅔ year	100,000,000	
To loss of productive power of 1½ million youths for ⅔ year	75,000,000	
To loss of earning power by having children driven out of school by difficulties of arithmetic as now taught	25,000,000	
To loss of time in making arithmetical calculations by men in trade, industries and manufactures	30,000,000	
To extra weighing and measuring instruments needed for sundry tables.	10,000,000	
To loss of time in making cross reductions to and from our system and metric system	5,000,000	
To loss of profit from foreign trade because our goods are not in metric units	20,000,000	
Total annual loss	$315,000,000	

Commenting for a moment on the credit side of the above ledger account, it can be said that recent psychology shows conclusively that training in common fractions and weights and measures cannot be of much practical help as so-called culture, or training for learning other things, unless those other things are closely related to them, and there are not many things in life so related to them once we had dropped our present weights and measures.

It may be complained that the expense of changing to the new system is not taken account of in the above table. The reason is that that expense would occur once for all. The above table deals with the *annual* cost of our present mediæval system.

One powerful reason for the adoption of the metric system different in character from the others is the ease of cheating by the old system. In the past the people have been unmercifully abused through short weights and measures. Many of the states have taken this matter up latterly and prosecuted merchants right and left. Nine-tenths of this trouble would disappear with the new system in use.

Let us consider now for a little time the reasons why the metric system has not been accepted and adopted for use in the United States. Evidently the great main reason has been that the masses of the people, in fact all of them except a very small educated class in science, are almost totally uninformed on this whole question. Such articles as have been published have almost invariably appeared in either scientific, technical or educational magazines, mostly the first, so that there has been no means of reaching the masses, or even the school teachers, with the facts. For another reason, the United States occupies an isolated position geographically, and our people do not come into personal contact with those in other countries using the metric system. But there is still another potent reason. After the United States Government legalized the metric system in 1866, all the school books on arithmetic began presenting the topic of the metric system, and, quite naturally, they did it by comparing its units with those of our system and calling for cross reductions from one system to the other. No better means of sickening the American children with the metric system could have been devised. Multitudes of the young formed a strong dislike for the foreign system with its foreign names, and could not now be easily convinced that it is not difficult to learn. Every school boy knows how easy it is to learn United States money. The boy just naturally learns it between two nights. The whole metric system *under favorable conditions* is learned nearly as easily. By favorable conditions is meant the constant use of the system in homes, schools, stores, etc. These favorable conditions, of course, we have never had.

In 1904 an earnest effort was made again both in this country and Great Britain to have the metric system adopted for general use. The exporting manufacturers in both countries grew much concerned over the whole situation. A petition to have the metric system adopted in Great Britain was signed by over 2,000,000 persons. A bill to make the system mandatory was passed by the House of Lords and its first reading in the House of Commons. The forces of conservatism then bestirred themselves and the bill was held up. Foreseeing a movement of the same kind in this country, the American Manufacturers' Association got busy, laid plans to defeat such movement, which they later did. Strictly speaking, this action was not taken by the association as such but only by a part of it. One-fourth of the membership and probably much more than a fourth of the capital of the association were on the side for the adoption of the system. Politically, however, the side opposed to the new system had altogether the most influence.

Careful study of the whole matter showed that the main cost to make the change to the new system would be in dies, patterns, gauges, jigs, etc. A careful estimate put this cost at $600 for each workman, and, assuming a million workmen, we have a total cost of $600,000,000. But we have just seen that the annual expense of retaining the old system of weights and measures is over $300,000,000. Thus we see that two short years would suffice to pay for what seems to the great manufacturers' association an insuperable expense. From all this we see that the question is not one for N. M. A. bookkeeping, but for national bookkeeping.

Many well informed people studying the matter superficially think the difficulties in the way of a change to the new system insurmountable. Thus, they think of the cost to the manufacturer—which we have just seen to be rather large but not insurmountable; they think of the changes needed in books, records, such as deeds, and the substitution of new measuring and weighing instruments. Germany and all the other countries of continental Europe made the change. Are we to assume that the United States cannot? That would be ridiculous. Granting that commerce has grown greatly; so also have intelligence and capability of the people for doing great things.

Scientists are universally agreed as to the wisdom of the adoption of the metric system. The country, as a whole, must be educated up to the notion that sooner or later it is sure to be universally adopted, that it is only a question of time when this will be done. Already electrical, chemical and optical manufacturing concerns use the metric units and system exclusively. The system is also used widely in medicine and still other arts. Then all institutions of learning use the metric system exclusively whenever this is possible. All that is needed is to complete a good work well begun.

There is one rational objection to the metric system and but one. It is that 10 is inferior to 12 as a base for a notation for numbers, but the world is not ready to make this change, nor is it likely to be for generations to come. Moreover, this improvement is far less important than uniformity in weights and measures. For these reasons this objection can be passed over. Men said the metric system would never be used outside of France; but it has come to be used all over the world. The prophets said we should never have uniformity as regards a reference meridian of longitude. But we have. And so it will be with the adoption of the metric system in the United States and Great Britain. It is only a question of whether it comes sooner or later. When that day comes, the metre, a long yard, will replace the yard; the litre, the quart (being smaller than a dry and larger than a liquid quart); the kilogramme will replace the pound, being equal to 2.2 pounds, and the kilometre (0.6 mi.) will replace the mile. Within a week or so after the change has been made to the new system, all men in business will be reasonably familiar with the new units and how they are used, and within a few months every man, woman and child will be as familiar with the new system as they ever were with the simplest parts of the old—so easy it will be to make the change, so far as ordinary business affairs are concerned. However, for exact metal manufacturers years will be needed to fully change over to the new. Here the plan is to begin with new unit constructions and new models, as automobiles using new machinery constructed in the integral units of the metric system. All old constructions are left as they are and repaired as they are. This was the plan used in Germany and of course it works.

In conclusion it can be said that we started with the idea that the change to the metric system was needed for the sake of foreign commerce. We now see that we need it also for our own commercial and manufacturing transactions. If we are to have the efficiency so insistently demanded by the age in which we live, then we must have the metric system in use for the ordinary affairs of daily life of the masses of the people, we must have it in commercial and manufacturing industries, and we must have it in education. If efficiency is to be the slogan, then the metric system must come, no matter what obstacles stand in its way.

SOME RELATIONS OF PLANTS TO DISTILLED WATER AND CERTAIN DILUTE TOXIC SOLUTIONS.[1]

By M. C. Merrill.

(*Continued from p. 82.*)

It will be noted that both represent the conductivity curve of distilled water containing the roots of seedling peas. The difference mentioned no doubt finds its explanation in the different conditions under which the two series were grown (the series for fig. 2 being run in the fall when the seeds were fresh, and that for fig. 3 in the winter), in the vigor of the seeds, and in the difference in the units used in plotting the curves. It must be said, however, that various factors of the problem of exosmosis from the roots of plants remain as yet unknown.

The early drop in the curve of the conductivity of the controls (1–4) is an interesting feature which would seem to be explained by an adsorption of the electrolytes on the surface of the chemically clean glass tumblers.

At the end of 20 days in distilled water the roots of the plants which had not been in full nutrient at all showed marked deterioration (being badly decomposed and covered with a gelatinous coating), while the roots of those which had previously been in full nutrient solution for some time remained normal in every respect, even after 20 days in distilled water.

These results seem plainly to indicate that injury which plants sustain in distilled water is very closely related either to the lack of available nutrients in the medium or of reserve food material in the tissues. A seedling is in an exceedingly plastic state of growth. If no food materials become available the embryonic tissues which are in such an active condition of growth soon become disorganized, possibly suffering partial autolysis and becoming the prey to bacterial and fungous action. We would expect, therefore, that the larger the seeds (and hence also the supply of stored materials), the longer the seedlings could remain in distilled water before deterioration. Comparison of True's results on *Lupinus* with those here presented on *Pisum sativum* and *Vicia faba* seems to fulfil that expectation. We should also expect that the more nutrient materials the plant absorbed, the better it would be able later to withstand any deteriorating influences in the distilled water, and the experiment above noted seems to bear out that idea also.

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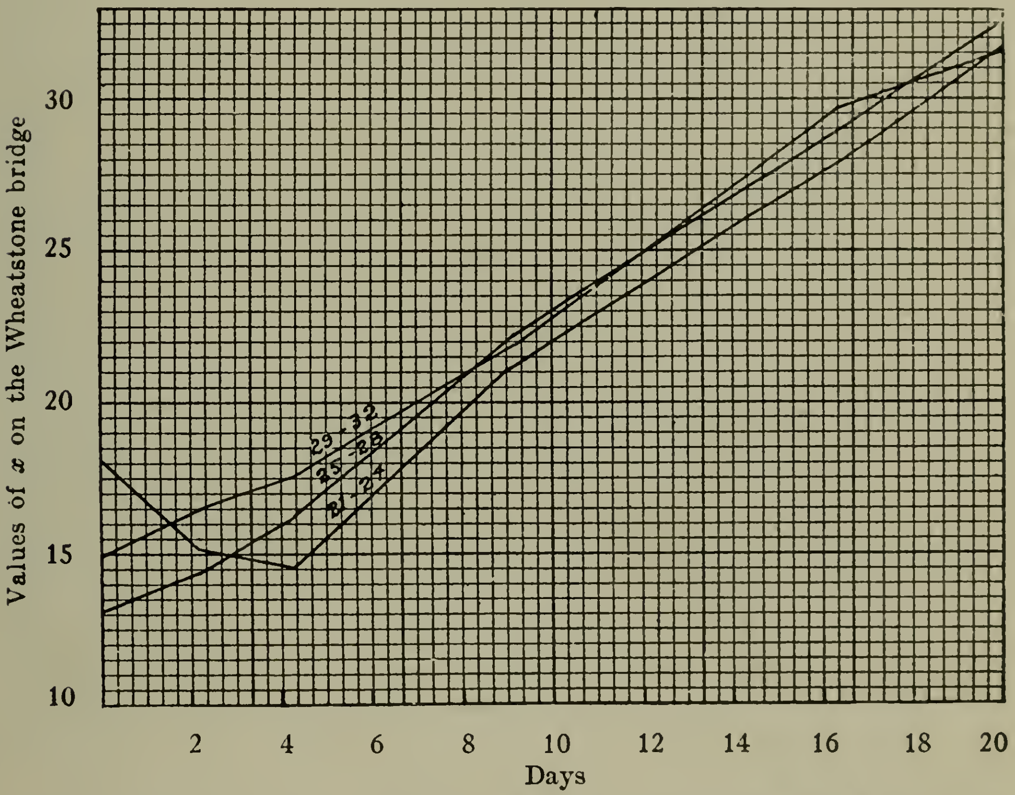
[1] Reprinted from *Annals of the Missouri Botanical Garden,* vol. 2, No. 3, pp. 459–498.

In the light of what has been said we are led to believe that the conductivity curve of Nos. 5–8 is not a pure representation of exosmosis and that the products of bacterial and fungous action and cell decomposition account for at least a part of the conductivity. While the same condition may be true of the other cultures to a certain extent, it no doubt plays a lesser, and real exosmosis a greater, part.

Fig. 4.



The conductivity curves for cultures in distilled water 20 days—after growth in full nutrient solution for 20 days. The initial temperatures of the distilled water into which the roots were placed were as follows: Nos. 21–24, 6.5° C.; Nos. 25–28, 17.2° C.; Nos. 29–32, 35° C.

In connection with the above experiment it was thought desirable to determine whether a difference in the initial temperature of the water into which the roots were placed had any immediate or subsequent effect upon the exosmosis from the roots; plants which had been grown in full nutrient solution for 20 days were used for this purpose. Four cultures were prepared with distilled water at a temperature of 6.5° C., four at 17.2° C., and four at 35.0° C., and conductivity readings were taken after exactly one-half hour, and then at various intervals for 20 days. No attempt was made to keep the water at the initial temperatures and it therefore gradually returned to the temperature of the room. After one-half hour, when the first readings were taken, the respective temperatures were 8.9° C., 16.6° C., and 27.4° C.

The average conductivities of the water of these cultures are plotted for 20 days in fig. 4, the same units being used as in fig. 3. From these results it may be concluded that the initial differences of temperature cannot be said to have exercised much, if any, effect. The results would probably have been different had the temperatures remained at the original point during the 20 days. Wächter ('05) has considered the rôle of the temperature factor in exosmosis.

VIII. Discussion and Conclusions.

It is believed that the evidence furnished is sufficient to support the conclusion that pure distilled water *per se* is not toxic or injurious to plants, and that various other factors enter in to cause the deterioration noted when plants are placed in that medium.

Of course by qualifying the assertion to include *pure* distilled water only, we have thus eliminated the effect that may be produced by toxic substances in the distilled water, no matter from whence derived. The abundance of work that has been done on the toxicity of various substances to plant tissues would of course lead us to expect injurious effects if such substances were present in any quantity in the distilled water. With that phase of the question we are therefore not much concerned at present. With a distilled water prepared as indicated, and with a specific conductivity which is approximately 2×10^{-6}, we have a water sufficiently pure for use in the consideration of other aspects of the question, and attention is directed to these.

The evidence presented has inclined us strongly to the view that the fundamental basis of the deterioration of plants in distilled water rests upon the food relations of such plants, but that, on the other hand, an exosmosis of food materials or nutrient salts is in no way responsible for the difficulty. It is considered that the question of the food relation plays an important rôle in the incipiency of the disorder, but that this is quickly followed by factors which have been initiated as a result of the inimical food or nutrient relation.

A plant must assuredly have food in order to thrive. The more food it has stored up in its tissues, the longer it can survive in a medium devoid of it. But because of the absence of available food it is believed that the tissues of the plant begin to become disorganized and in that condition fall a ready prey to bacterial and fungous action, which may then set in and play a very important part in the subsequent decomposition of the tissues.

While it may seem paradoxical to assert in one clause that absence of food is the fundamental basis of the injury which plants undergo in distilled water, and in the very next to say that exosmosis of nutrient salts plays no rôle, yet the results obtained have substantiated that idea. Furthermore, it is essential to consider the various other factors attendant upon these two conditions in order to arrive at the proper conclusions respecting their operation. Among such factors may be mentioned the decrease in conductivity after a short period coincident with exosmosis from normal tissues, the relation of sterilization to bacterial and fungous action, the recovery of plants under different conditions, and the numerous other questions already considered in the body of the article, all of which lend weight to the conclusions arrived at.

IX. SUMMARY.

A brief historical review is given in this paper of the views held in regard to the cause of injury to plants in distilled water.

The methods of work are outlined.

The experimental work is given and the results discussed, especially with reference to the conclusions of other workers.

A discussion is given of the results obtained in the experimental work and the conclusions derived therefrom are stated.

Some of the results obtained from the experimental work may be summarized as follows:

(*a*) Renewing the distilled water of the cultures every 4 days was in general beneficial, as shown by increased growth of both tops and roots. The plants were also able to survive longer in the renewed than in the unrenewed distilled water, and continued growth better after being placed in a full nutrient solution.

(*b*) The period between 5 and 10 days in distilled water is a crucial one for plants; if they remain longer in this medium they are unable to recover normally or completely when subsequently placed in a full nutrient solution.

(*c*) By keeping the plants in distilled water a certain period before transferring to full nutrient solution the maturity of the plants is delayed.

(*d*) The longest period during which plants can be kept in distilled water and later recover on being placed in full nutrient solution was found to be 30–40 days. For certain dilute toxic solutions this period was much less, thus indicating that the so-called toxicity of distilled water is, if it exists at all, very slight.

(*e*) The lateral roots of "boundary cultures" were characteristically long and thread-like.

(*f*) Sterilizing the distilled water by boiling one-half hour every 4 days exercised a beneficial effect upon the growth of plants in that medium as compared with the growth of those in unsterilized distilled water.

(*g*) Greater total exosmosis was obtained in the renewed than in the unrenewed distilled water.

(*h*) Normal plants which have been grown for some time in full nutrient medium and then transferred to distilled water exhibit at first greater excretion than absorption of electrolytes. After one or two days, however, there is greater absorption than excretion and the conductivity curve declines. This condition may be maintained for a considerable period.

(*i*) The conductivity curve of the full nutrient solution in which plants were grown rapidly fell during the first 15 days or so; then it was more or less horizontal for a period, and finally began to incline after about 50 days. The growth curve was in general opposite in character to the conductivity curve.

(*j*) The conductivity of the distilled water in one series in which the roots of pea seedlings were placed was practically the same on the 10th as on the 5th day. After the 10th day it rose considerably. The growth curve showed a rise the first ten days, then a decline.

(*k*) Higher conductivity in the distilled water after 20 days was caused by plants which had not previously been in full nutrient solution than by plants grown for a time in full nutrient solution before transference to distilled water. The former cultures also failed to give the decline in conductivity characteristic of normal plants transferred from full nutrient solution to distilled water.

(*l*) Greater deterioration of the roots in distilled water occurred if the plants had not previously been in full nutrient solution than in the case of plants which had been grown for a time in the latter medium.

(*m*) Initial difference of temperature of the distilled water produced no effect on the exosmosis of electrolytes.

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PYORRHŒA ALVEOLARIS.

Preliminary Report on Treatment with Ipecac and Emetin Hydrochloride.[1]

By John S. Ruoff, Assistant Surgeon, United States Public Health Service, Fort Stanton Sanatorium for Tuberculosis.

The investigation of the curative effects of ipecac and emetin in pyorrhœa alveolaris was instituted by direction of the Surgeon General, United States Public Health Service, the conditions at this station (Fort Stanton) being especially suitable for the work. The patients are under the immediate surveillance of the officer in charge and are at all times accessible for the administration of treatment. Every encouragement was offered for a thorough trial. The coöperation of the patient was further enlisted by pointing out the possible effects of pyorrhœa alveolaris on tuberculosis and the good that might result from the cure of existing pyorrhœa. The work has been under way for nine months. It is still being pursued.

In setting forth the results obtained in the treatment of pyorrhœa alveolaris at the Fort Stanton Sanatorium, a few words as to the class and character of patients treated will not be out of place.

The patients at this sanatorium consist of the beneficiaries of the

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[1] Reprinted from *Public Health Reports,* January, 1916, p. 108.

United States Public Health Service, made up in this instance chiefly of seamen and officers of merchant vessels. A large percentage of these men have never taken proper care of their teeth; thus out of 78 cases treated 51 had always neglected their teeth. The care bestowed by the remainder is doubtful. Pyorrhœa, as stated by the leading workers with the disease to-day, is practically universal and one would naturally expect to find a large percentage of far-advanced cases among this class of men. Of the 78 treated, 34 (43.6 per cent.) were far-advanced cases of pyorrhœa. All of these patients have tuberculosis in some stage, but mostly far advanced.

Knowing that the tuberculous patient is subject to disturbances of the alimentary tract, and knowing too that emetin tends to cause nausea, vomiting, and diarrhœa, it will be correctly surmised that the investigators have had more than their share of these symptoms to contend with. Also, they have had to content themselves with the minimum number of injections in each case for fear of upsetting the stomach and causing the patient to become dissatisfied and discontinue the treatment altogether. In a large number of cases they have had to use emetin hypodermatically until the endameba were no longer demonstrable, and then to depend upon the local use of a mouth wash of fluidextract of ipecac in an effort to maintain the condition.

Knowing the tendency of the tuberculous subject to become hypochondriacal, neurasthenic, nervous, his tendency to complain of the least discomfort, and knowing, too, the discomfort and pain, at times extreme, caused by the local reaction of emetin given hypodermatically, one will surmise, and correctly, that the investigators have had to contend with many complaints of painful arms and have had to discontinue the hypodermatic treatment for that reason in many of their cases. It may also be added here that the number of cases treated would have been much larger had it not been for the local discomfort and other deleterious effects caused by emetin, these effects causing the treatment to be contraindicated in some and refused by a large number of subjects in whom it was indicated.

Recent writers state that about 98 per cent. of all persons will show the endameba-buccalis. Of 190 examined here, 187 showed the endameba. Our cases were chosen at random among the patients. Practically all of them seemed to have a pyorrhœal tendency, although of the 78 treated, 14 had no clinical symptoms of pyorrhœa, while the remainder, 64, had one or more of the clinical symptoms: viz., pockets, pus, loose teeth, receding gums, and bleeding gums. Of these, the last-named symptom was the most frequently found, occurring in 51 of the 64 cases. It may be stated that this symptom of bleeding gums was the one most frequently affected by the emetin and ipecac, and always the first to disappear.

The investigators followed in a general way the plan of treatment set forth by Bass and Johns in their book, " Pyorrhœa Alveola-Dentalis." Each patient was given an initial examination, his history being taken at the same time to determine as nearly as possible the date of onset, amount of care taken of the teeth, the use of tobacco, the condition of the digestive apparatus, and the presence or absence of bleeding gums. He was then sent to the dentist and a careful examination of the mouth made to determine the condition of the teeth and gums. The teeth were then scaled, old roots and hopeless teeth were extracted, and the mouth was put in as good condition as possible, some of the actual operative work being done by the writer. No other operative procedures were attempted, and no routine treatment of the teeth and gums was carried out other than by the brush in the hands of the patient. He was next sent to the laboratory, where a microscopical examination was made for endameba.

For the convenience of study, and ease in tabulating and comparing results, the cases were divided into classes, as shown below.

At the time of scaling by the dentist each patient was given a supply of fluidextract of ipecac to use locally. The first two classes to be treated were directed to use two or three drops on the brush. The investigators also used a tooth powder modified by mixing with the stock 5 grams of powdered ipecac to 95 grams of the powder, but this was later discontinued and all were directed to use 10 drops of fluidextract of ipecac in one-fourth to one-half glass of water as a mouth wash after cleaning the teeth morning and night.

CLASS I.

This consisted of 20 men, of whom 2 (squad A) had apparently healthy mouths; 7 (squad B) had receding or bleeding gums or both; while 11 had gross lesions of pyorrhœa. All received three ½-grain (0.03 gram) doses of emetin on consecutive days and were examined for endamebæ on the fourth day, and all found positive. This treatment was repeated on the three following days, and upon re-examination 11 were found negative, 7 were still positive, and 2 were discontinued on account of nausea, vomiting, and loss of appetite. These

7 were then given three ¾-gram (0.045 gram) doses of emetin on consecutive days, and upon re-examination 6 were negative and 1 still showed endamebæ. This one case was given three more ¾-grain (0.045 gram) doses of emetin on the next three days and was finally negative after the twelfth dose, having received six doses of one-half grain (0.03 gram) each and six doses of three-fourths grain (0.045 gram) each, covering a period of 12 days.

Subsequent History of Class 1.—All continued to use the fluid-extract of ipecac locally, but in spite of this every member of class 1 showed the endamebæ upon re-examination four weeks later. The physical condition of the gums and teeth in squad A was unchanged; 4 of squad B remained the same, 2 were moderately improved, and the results were doubtful in 1; of squad C, 8 remained the same, 1 was slightly improved, and 2 were greatly improved.

At the time of writing, three and one-half months later, the condition of these mouths has not changed.

CLASS 2.

This consisted of 12 men, of whom 4 (squad A) had healthy mouths; 8 (squad B) had receding or bleeding gums, or both; there were no far-advanced cases of pyorrhœa in this class. All received three ½-grain (0.03 gram) doses of emetin on consecutive days and were examined on the fourth day. Of the 12 men, 6 were negative after three doses of one-half grain (0.03 gram) each; 1 discontinued treatment on account of rise of temperature; the remaining 5 received three more ½-grain (0.03 gram) doses on the next three days; and all were found negative after the sixth dose.

Subsequent History of Class 2.—All continued the use of fluid-extract of ipecac locally, but all showed the endamebæ three weeks later. The physical condition of the gums and teeth in squad A and 5 of squad B remained the same, while 3 of the latter were slightly improved.

At the time of writing, three months later, the physical condition of these mouths is unchanged.

CLASS 3.

This class consisted of 13 men, of whom 1 had a healthy mouth, 8 (squad B) had receding or bleeding gums or both, and 4 had gross lesions of pyorrhœa. None were negative after three doses of one-half grain (0.03 gram) each, but 6 were negative after six doses of one-half grain (0.03 gram) each; the remaining 6 were still positive, but were discontinued on account of various disagreeable symptoms.

Subsequent History of Class 3.—All continued the local use of fluidextract of ipecac, but 11 of the 12 men showed the endamebæ two weeks later. The physical condition of the gums and teeth in the 1 healthy mouth remained unchanged, 4 of squad B were slightly improved, and 3 were moderately improved. In squad C, 2 were slightly improved, while 2 remained the same.

At the time of writing, nearly three months later, the physical condition of these mouths is unchanged.

CLASS 4.

This class consisted of 5 men, all with unusually good teeth, but with incipient pyorrhœa. No emetin was given hypodermatically. These men were all given a mouth wash of diluted hydrogen peroxide and fluidextract of ipecac. After brushing the teeth the mouth was rinsed with hydrogen peroxide, then with fluidextract of ipecac, 10 drops in one-fourth glass of water. This was kept up twice daily for two months, at the end of which time they all still showed the endameba and no improvement in the physical appearance of the gums and teeth.

Our experience is thus at variance with the results recorded by Bass and Johns in work with a similar class of cases.

CLASS 5.

This consisted of 12 men, of whom 1 (squad A) had a healthy mouth, 6 (squad B) had either receding or bleeding gums or both, and 5 showed gross pyorrhœal lesions. Four were negative after three doses of one-half grain (0.03 gram) each, 1 discontinued treatment on account of rise of temperature. Seven men received six doses of one-half grain (0.03 gram) each, but only 2 were rendered negative; the remaining 5 discontinued treatment on account of various disagreeable symptoms.

Subsequent History of Class 5.—Eleven of the 12 men showed the endameba four weeks later in spite of using fluidextract of ipecac as a mouth wash. The physical condition of the gums and teeth in the 1 healthy mouth remained the same, 2 of squad B remained unchanged, and 4 were slightly improved. In squad C, 1 was slightly improved and 4 were moderately improved.

At the time of writing, two and one-half months later, the condition of all these mouths is the same.

CLASS 6.

This class consisted of 16 men, of whom 1 (squad A) had a healthy mouth, 5 (squad B) had receding or bleeding gums or both, and 10 (squad C) had gross lesions of pyorrhœa. All received six ½-grain (0.03 gram) doses of emetin on consecutive days before being re-examined. Twelve were negative after the sixth dose, 1 discontinued treatment on account of local reaction, 3 were still positive but were discontinued on account of the exhaustion of our supply of emetin.

Special Technic in Observations on Local Reaction.—This class was subdivided into four smaller groups of four men each. Group A received hypodermatic injections of emetin dissolved in 2 c.c. of water injected into the arm. Group B received emetin dissolved in 4 c.c. of water injected into the arm. Group C received emetin dissolved in 2 c.c. of water injected into the buttocks. Group D received emetin dissolved in 2 c.c. of normal saline solution injected into the arm. No marked difference in the amount of local reaction was noticed.

Subsequent History of Class 6.—Of the 12 men that were negative after the sixth dose of emetin, 10 were re-examined four months later and all found positive, although all used fluidextract of ipecac as a mouth wash twice daily. The physical condition of the gums and teeth in the 1 healthy mouth and in 2 of squad B and in 4 of squad C remained the same. Two of squad B and 5 of squad C were slightly improved. The results were doubtful in 1 man in squad B, while 1 of squad C became worse.

At the time of writing, two months later, the physical condition of the gums and teeth remains unchanged.

STATUS OF PYORRHŒA TREATMENT IN THE LITERATURE.

Ernest Sturridge, D.D.S., London,[2] prefers the treatment of pyorrhœa by ionization with zinc ions, and says "after treatment by ionization alone with zinc chloride" he found in every instance that amebæ were not present upon re-examination. He recommends in addition careful cleansing and instrumentation and the application of a weak solution of iodine in bad cases, as advocated by Dr. Barrett.

Barton Lisle Wright and Paul Gardiner White, United States

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[2] Ernest Sturridge, D.D.S., *Dental Cosmos*, July, 1915.

Navy,[3] give deep muscular injections of mercuric succinamid and claim good results.

F. E. Stewart, M.D., Phar.D., Philadelphia,[4] recommends thorough removal of all tartar and dead and infected pulps, the filling of root canals, the use of fluidextract of ipecac or emetin as a local application to the gums and teeth in tooth washes, the employment of emetin to destroy endamebæ, and the injection of bacterin, either a stock bacterin or an autogenous vaccine.

Arthur H. Merritt, D.D.S., New York,[5] places no confidence in either emetin or vaccines when he says that "no drug or vaccine ever will of itself cure the disease." He believes pyorrhœa to be a preventable disease, and a curable disease if not too long neglected. His treatment consists in a "careful curettage of each pyorrhœal pocket, the removal of calcareous deposits and necrotic tissue, the correction of occlusion on weakened teeth, the stimulation and massage of the gums, and the maintenance of a high standard of mouth hygiene."

T. Sidney Smith, Palo Alto, Cal., [6] has confidence in proper surgical treatment of pyorrhœa, and says, "Peridontal diseases are not cured until the pyorrhœal pockets have been entirely obliterated," and "that such healing does not depend on either the absence or presence of endamebæ, but entirely on the character of the tissues and the thoroughness of the surgery."

SUMMARY OF RESULTS.

Of 190 cases examined 187 showed endameba. Of the 187, 78 have been treated for pyorrhœa. Of the 78 treated, none lost their endamebæ permanently. The condition of the gums and teeth was greatly improved in 3 cases, moderately improved in 9 cases, slightly improved in 22 cases, while 41 cases remained the same; the results were doubtful in 2 cases and 1 case became worse. Practically all that were found negative for endamebæ at the conclusion of the injections were found positive for endamebæ from two weeks to four months later, in spite of using a solution of ipecac as a mouth wash.

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[3] Barton Lisle Wright, M.D., and Paul Gardiner White, M.D., *Dental Cosmos,* July, 1915.

[4] F. E. Stewart, M.D., Phar.D., *New York Medical Journal,* Aug. 7, 1915.

[5] Arthur H. Merritt, D.D.S., *Ibid.*, Aug. 7, 1915.

[6] T. Sidney Smith, D.D.S., *Journal A. M. A.*, May 8, 1915.

CONCLUSION.

Emetin is an ambecide, but alone will not cure pyorrhœa alveolaris.

OUTLINE OF FUTURE WORK.

Less confidence will hereafter be placed in the properties of emetin or other preparations of ipecac, although it is not denied that the drug possesses ambecidal properties. It appears necessary to revert to a degree at least to those painstaking and tedious operative procedures, the efficacy of which has long been known to dental surgeons. Just how much assistance is to be expected from the ipecac preparations used in conjunction with operative measures is a question upon which further studies may be expected to throw some light.

ACKNOWLEDGMENTS.

Surg. F. C. Smith, in charge of the station, has made valuable suggestions in the preparation of this article. Acting Asst. Surg. H. P. Reid has done most of the microscopic work, and the station dentist, Dr. C. R. Irby, has performed most of the necessary operative work.

THE IMPORTANCE OF DRUG PLANT CULTIVATION IN THE UNITED STATES.[1]

By HEBER W. YOUNGKEN, PH.D., Adjunct Professor of Botany and Pharmacognosy, Medico-Chirurgical College.

The present European conflict has done much toward arousing the spirit of initiative on the part of Americans, not only in investigating an economic means for the manufacture of dyestuffs and various synthetic chemicals previously alone carried on by the Germans, but also in stimulating research along the important line of drug plant cultivation. More than one-half of our most important crude drugs and their products come from foreign sources. Before the war these were in regular commerce, and efforts at cultivation, mostly experimental, were confined to the U. S. Department of Agriculture, a few interested teachers and several pharmaceutical houses. Now that importation of drug plants has practically ceased, their cultivation in this country is necessary. Indigenous drug plants, too, which at one time grew abundantly in our forests and meadows, have been gradually disappearing with the spread of population and agriculture and depredations of unintelligent drug collectors.

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[1] Reprinted from the *Mulford Digest*, vol. iii, p. 86.

The mere raising of medicinal plants to supply the quantitative demand for crude drugs, however, is not the only problem which confronts the manufacturing pharmacist. With the demand for accurately standardized medicinal products of known potency and quality the need of controlling drug plants in regard to botanical species, method of selection of seed, pollinization, cultivation, harvesting, curing, etc., is apparent.

To attempt to grow very many species of drug plants in any one locality is well-nigh impossible, since it has been shown the necessary environments differ widely for diverse types of vegetation. The first step, therefore, should be taken with a view toward developing conditions for the various species to be grown approaching those under which they are found in nature. Xerophytes, or desert plants, for example, would not thrive in soil, climate or other surroundings adapted solely to mesophytes or middle plants, nor would certain genera of the same family of either of these groups, such as Digitalis and Strophanthus of the Scrophulariaceæ family of mesophytes grow equally well under identical conditions. Hence the nature of the soil, climate and proximity of other plants must be studied for each plant selected for cultivation in any given section.

It is also desirable to inquire into the best ways of propagating the plants. Occasionally this is by means of seeds, as in digitalis, belladonna, stramonium, hyoscyamus and all annuals and biennials; at other times it is by the propagation of prostrate stems, as in many of the labiatæ or mint family; or again by the propagation of rhizomes, as in ginger or hydrastis. After the seeds and cuttings are planted and transplanted (if necessary) the next step is the proper care in rearing the plants to maturity or to that stage when it is desirable to harvest the drug. While the plants are in flower, efforts should be made toward hybridization or crossing of varieties or species, with an aim toward increasing the active principle content of the resultant hybrids. It is known that the cultivation of cinchona has increased the alkaloidal yield 5 to 6 per cent., while hybridization of different species and varieties of cinchona has increased the alkaloidal content of the product hybrids as much as 11 to 12 per cent. above the quantity found in either of the parents crossed. Careful selection of strains found among the hybrids of the second generation yielding a high active principle content might be found a profitable undertaking.

In addition to harvesting at the proper time and correct methods of drying, some drugs, such as vanilla, coca, digitalis, belladonna, hyoscyamus, etc., undergo fermentation. This is called the curing process. The biological factors in this process must be carefully investigated in order to determine at what time and under what conditions the drug acquires its greatest value.

The manufacturing pharmaceutical houses of this country are in the best position at the present time to cope with the problems of drug plant cultivation, because they have the necessary facilities as well as the coöperation of trained pharmacognocists, chemists, pharmacists and biologists. The subject is in its infancy and much experimental work, especially in the matter of selection, must be carried out before the problems at hand are adequately solved.

The H. K. Mulford Company has been cultivating drugs on an extensive scale for the past five years. Their efforts so far have been in the line of securing a sufficient supply of reliable digitalis, belladonna, hyoscyamus, hydrastis and cannabis, the cultivation, collection and curing of each drug receiving careful consideration.

The cultivation of the drug plants from which the physicians' medicines are prepared marks another step toward converting medicine into an exact science. Standardization of drugs by methods of control and testing, operating from the time the seed of the plant is placed in the ground, not neglecting the selection of the seed itself, until the medicinal product is ready for the physicians' use, thus insuring a product of known and invariable potency, will alone make possible accurate observation of the effects of such drugs when used as weapons with which to fight disease.

CORRESPONDENCE.

Increase of Prices for Drugs and Chemicals.

The February meeting of the City of Washington Branch of the American Pharmaceutical Association was held at the National College of Pharmacy, Washington, Wednesday, February 23, 1916.

The subject of the evening was a talk on the increase of prices for drugs and chemicals, the cause and effects, together with the future prospects, by Mr. Wymond H. Bradbury, assisted by Mr. M. I. Wilbert.

Mr. Bradbury discussed the subject very fully and brought out many points of interest, and clearly showed that the first rise in prices of drugs and chemicals was due directly to the disturbance in Europe and the general opinion that the war would last but a year, the result being that large manufacturers, at once, when hostilities broke out, purchased their supplies for a year; at the expiration of this time, when their stocks were running low, they went again into the market, heavily buying everything obtainable, with the effect that prices again soared, thus marking two separate and distinct, decided advances.

He further showed that by reason of embargoes all drugs grown in the restricted districts were not obtainable; likewise this is true of chemicals made abroad, many of which have never been made in America. Imports are difficult, high insurance rates on cargoes, and no available ships, with exports practically cut off and large demands from abroad, have assisted in the advance of domestic-made goods.

Many commodities are controlled by second hands who are holding for large increases. The potassium situation is a serious one and may result in the replacing of all potassium salts with sodium. The large increase in bromides is due principally to the increased demand for bromine in the manufacture of gas bombs. Many chemicals, as well as foreign-grown drugs, are now unobtainable or the price is prohibitive. The increases in prices of sulphuric acid, soda ash, and many other products have caused material increases in prices of glassware and other manufactured products. He pointed out that 10 per cent. of the glycerin made in America was used by the duPont Powder Works. At the present time American manufacturers are refusing to sell the product for dynamite manufacture. Zinc and copper and their salts have increased, owing to their use in war materials.

The probable future will be that the abnormal prices will drop, owing to increased growing and manufacturing by the countries at war, but no such low prices as prevailed before the war can be expected, probably not for years. Many products, especially trademarked goods, will never return to their former basis; the general cut in price for these articles by the retail trade has shown the manufacturers that they can increase their price and still the public will obtain the goods at less than the manufacturer's advertised price, owing to the cut-rate evil. He also pointed out the possibility of the placing of export duties on many products by foreign countries and also government control of many drugs, thereby maintaining higher prices than before the war. This is shown by the action of Mexico with reference to vanilla, and Great Britain with sandal and buchu.

He maintained that, while the retail trade had been affected, it was not as seriously affected as the manufacturer and wholesaler.

The paper was discussed at some length by the members present, and the attendance at this meeting was larger than usual. It was pointed out by Mr. Wilbert that we in America were much better off than many foreign countries. Many articles are unobtainable or at prices many times higher than in this country. He also showed that many agents in this country of German houses were now making many of the products, and while, in many cases, they are obtaining advanced prices, they at the same time are keeping the market for the German manufacturers, so that when the war ends they will not have to reëstablish their business in this country. He further pointed out that much more manufacturing would now be carried on if the manufacturers were assured that they would receive some kind of protection. Politics here is playing an important part. The condition now existing has resulted in the markets being flooded with all kinds of fake goods, principally by peddlers, all of whom have been working all kinds of schemes, so that it is dangerous to purchase any products from any but legitimate dealers unless same and every lot and package are carefully tested.

S. L. Hilton,
Secretary.

CULTIVATION OF MEDICINAL PLANTS.[1]

Trial Cultivation in Usumbwa.

In a report by H. L. Hammerstein [2] on part of the trial cultivations hitherto carried out in the Tabora district, Usumbwa territory, German East Africa, we likewise find something interesting for our special domain, *e.g.*, that betel pepper (*Piper Betle*, L.) prospers fairly well in soil to which lime has been added. It climbs on *Ficus* species, but is very sensitive as regards intense insolation.

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[1] Semi-annual Report on Essential Oils, Synthetic Perfumes, etc., by Schimmel & Co., October, 1914, to April, 1915.

[2] *Der Pflanzer,* 10 (1914), 224.

The *Juniperus procera*[3] trees (Usambara cedar), now 2 years old, are of vigorous growth and have attained a height of 1 m. The prolonged drought in that region has not had any influence on their development. All *Eucalyptus* species have much to suffer from termites. Two-year-old specimens of *Eucalyptus robusta* and *rudis* have now attained a height of up to 4 m., and the diameter of the trunks comes to about 10 cm. Citronella grass prospers; the propagation is effected by suckers. *Andropogon citratus* is indicated as mother plant, so that there seems to be a confusion with lemongrass.

Grafted young Italian lemon trees, received from Amani in December, blossomed after barely 3 years, and some formed fruit. Plants derived from seeds are still far behindhand. Limetta trees grow rather slowly. Genuine, grafted Italian orange trees flourish best. Seedlings grow very slowly at first; the seeds often take 5 to 6 months to germinate. Mandarine trees get on slowly and are highly sensitive as regards burning sunshine. The nutmeg trees died. Ginger grows slowly; cardamoms flourish better. Caraway and anise do not form seed; coriander grows well. Many other plants of the spice and kitchen herb line flourish well or in any case satisfactorily, *f.i.* balm (melissa), chervil, fennel, dill, marjoram, thyme, estragon, satureja, and parsley.

CULTIVATION OF MEDICINAL PLANTS.

From E. Senft's[4] communications on trial cultivation of medicinal plants at Korneuburg in 1913, we gather some data of general interest concerning aromatic plants. From the group of vegetal parasites, *Puccinia Menthæ* ought to be mentioned. Japanese peppermint suffered most from it. Leaf-lice (*Aphis Angelicæ* and *Ligustici*) caused damage in angelica and lovage fields.

Larvæ of beetles (*Agriotes*) and multipeds (*Blanjulus*) damaged angelica roots. In autumn, 1912, angelica seed was sown on a small piece of land; during the spring following the plants developed fairly well, but later on large gaps appeared, owing to the damage done by multipeds. Many rootlets were much eaten; the main roots, sometimes pierced. Further reports are made on the plantations of Roman chamomiles, wormwood, estragon, spoonwort, lavender, lovage, balm (melissa), peppermint, *Mentha canadensis* (Japanese peppermint), spearmint (*Mentha viridis*), *Mentha* from Admont (Styria), from Bohemia, from Moravia, winter marjoram, garden rue, parsley, sage, *Salvia Sclarea*, tansy, thyme, hyssop and valerian.

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[3] The wood of *Juniperus procera* is used in the manufacture of lead-pencils.—*Comp. Report,* October, 1911, 106.

[4] *Zeitschr. f. d. landwirtsch. Versuchsw. in Österreich,* 1914, Part 3/4. *Mitteilungen des Komitees zur staatlichen Förderung der Kultur von Arzneipflanzen in Österreich,* Nr. 17. From a reprint kindly sent us.

In addition to the simple Roman chamomiles (*Anthemis nobilis*), there was another variety of cultivation, *Anthemis nobilis* var. *β-flosculа*, Pers. (*Anthemis aurea*, DC.), which distinguishes itself by having lost the marginal flowerets completely. This variety is said to have a specially strong aromatic odor.

Manuring experiments gave satisfactory results with wormwood. The yield amounted to 98.6 kilos of fresh and 24.2 kilos of dried herb per square m. for a manured piece of land, and 63.1 kilos and 16.15 kilos, respectively, for unmanured soil. Wormwood-growing in Austria pays only where ground and labor are cheap. Wormwood does not require any special care, aside from keeping the field free from weeds. In consequence, waste grounds, slopes, etc., are best adapted for it, where it can spread by itself. Wormwood, which has again run wild, is sometimes preferred to the cultivated plant.

From a surface of only 8 square m. not less than 47.9 kilos of fresh estragon herb were collected.

Spoonwort was sown on April 30. On October 8 the plants were put on a piece of land freshly prepared. They stood the winter very well and sent out flower stalks already at the end of February; at the beginning of May the field was in full bloom. Cutting caused not only fresh leaves to form, but likewise fresh flower stalks.

Senft thinks a successful cultivation of lavender impossible at Korneuburg, as lavender requires protection against wind.

It is worth mentioning that lovage was the only plant which did not suffer from canker-worms.

On unmanured soil, 8.6 kilos of spearmint were obtained per 100 square m., whereas a manured piece of land yielded 15.87 kilos. Spearmint leaves are crisped and rather short in proportion. These crisped leaves extend remarkably, however, when the plant forms flowers; the crisped border then disappears and the aspect of the plant changes altogether.

The peppermint plants got through the winter rather badly. They remained low and looked sickly; some turned reddish at first, then brown, and died. The cause of this disease has not been found so far.

Mentha viridis seems to be very resistant against *Puccinia*; the disease was neither noticed at Korneuburg nor elsewhere. A plantation of a peppermint variety, cultivated in the marsh farm at Admont (Styria), was almost entirely destroyed by parasites.

In order to obtain parsley roots, it seems to be advisable to cut down the flower stalks, so that the roots can get stronger.

Hyssop and garden rue yielded less on a manured piece of land than on unmanured ground.

Sage frequently suffered from the winds generally prevailing at Korneuburg. Moreover, sage must never be left over 3 years in the same place, as the yield generally diminishes considerably already in the fourth year. Like rue, sage is unfavorably influenced by stable manure.

A plantation of thyme had developed very well and not suffered at all from the drought early in 1913.

A plantation of valerian was almost entirely destroyed by cankerworms.

As far back as 1904, B. Pater [5] tried to cultivate medicinal plants at Klausenburg. He now reports on spearmint and peppermint. Spearmint was cut first at the end of June, then again at the end of September, and a third time between October 17 and 22. In order to find out what effect the third cut might have, he left half the field untouched; it turned out the next year that the third cut had not had any influence on the plants getting through the winter. He recommends as the best remedy against *Puccinia Menthæ* to cut the plants earlier and not to wait until the flowers appear. It is true, one generally imagines that the plant is richest in oil when flowering, but it must be taken into consideration that the leaves attacked by *Puccinia* are without any value. *Puccinia* seems to spread from the soil, for the bottom leaves show the disease first, and then it spreads upwards.

Pater further describes the properties of Hungarian spearmint oil, on which we have reported before now.[6] Experiments of perfuming soap with spearmint oil gave very favorable results. An antiseptic soap of pleasant odor was thus obtained, which made the skin soft and smooth.

Pater reports fully on his experiments with peppermint. He cultivated plants which came from Rev. Josef Agnelli's plantation at Csári and which he calls *Mentha piperita* var. *Agnelliana*. The herb was dried naturally as well as artificially, this in a heatable hop-oast. The naturally-dried peppermint contained 0.7024 p.c., that dried artificially, 0.8844 p.c. of oil. Peppermint planted in spring 1908 was already in 1912 very weak and degenerated, so that it could hardly be used. The soil was poor and exhausted from the outset, which accounts perhaps for the failure of the experiment.

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[5] *Die Heilpflanzenversuchsanstalt der landwirtschaftlichen Akademie in Kolozsvar,* Part 1; Kolozsvar, 1914.

[6] *Comp. Report,* April, 1912, 118.

The properties of Hungarian peppermint oil,[7] as well as of *Oleum Menthæ aquaticæ Hung.*,[8] were described by us already three years ago.

Experiments with Mitcham and Japanese peppermint are also being made. About 80,000 slips of Mitcham peppermint are required for 1 hectare of land.

In 1904, Pater planted pieces of rhizomes, taken from calamus plants from a pond close by, on a bed which could easily be watered. In October, 1906, the calamus was well developed. The bed had, it is true, frequently been weeded, hoed and manured. The result was satisfactory.

THE CULTIVATION OF VIOLETS IN SOUTHERN FRANCE.

In an article published by a French horticultural journal,[9] we find an exact description of the cultivation of violets in southern France, as well as statistics of the export of violets from Hyères. The cultivation was begun there about 30 years ago; it has developed to such an extent that in winter more than 500 parcels of 3 kilos each are sent off daily. There are 500 to 600 women employed in the gathering. Of late years, Vence, a village in the Maritime Alps (*arrondissement* Grasse), seriously competes with Hyères. For half a century, flowers for the perfumery industry had been grown at Vence, but on account of the low prices offered by the manufacturers, a start was made to cultivate violets for the export of the flowers, with remarkable success. The varieties mostly planted are "Victoria" and "Princesse-de-Galles."

At Hyères, the violets are still frequently grown on open fields, but of late the growers have begun to cover the plantations slightly against frost, which causes the flowers to appear sooner.

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[7] *Comp. Report*, April, 1911, 91.

[8] *Ibid.*, April, 1912, 132.

[9] *Bull. Soc. Hort. Nice*, 17 (1913), 373; *Bull. Sciences pharmacol.*, 21 (1914), 234.

DIRECTIONS HOW TO COLLECT AND PRESERVE PLANTS IN FOREIGN COUNTRIES.

For those desiring to send home plants from distant regions or to collect plants in foreign countries for scientific purposes, an article in the well-known "Kew Garden Bulletin of Miscellaneous Information" gives useful, adequate directions.[10] If it is a question of collecting new material for gardeners, seeds are preferable to living plants or cuttings. Some plants, however, such as orchids, many tuberous plants (*Aroideæ*) and some *Zingiberaceæ,* cannot, or only with difficulty, be raised from seeds. The seeds must be ripe and dry and are best forwarded in small canvas bags. Hermetically sealed tins and bottles are not to be recommended, as seeds keep better if change of air is possible. Bulbs and rhizomes should only be collected after the period of vegetation is over and must be kept dry for some days, until the leaves have faded. They are best forwarded in wooden boxes and packed in wood shavings, paper, or some other dry, light material. Straw and hay cannot be recommended, as they rot easily. If the rhizomes are weakly and thin, they are best packed in a light, slightly moistened material, such as cocoa-nut fibres, peaty soil, sawdust or wood shavings. Rhizomes and seeds of aquatic plants and ferns are best sent in damp moss. Cuttings, *e.g.,* of *Pelargonium* species, should be packed in oiled silk and then placed in tins or wooden boxes. Many plants, such as pelargoniums, which are very resistant against drought, may be put into wooden boxes, the roots being tightly packed in moss, wood shavings, banana leaves, etc. Seeds for museums may be sent dry without any special precautions. If damage through insects is to be feared, carbon disulphide must be poured over the seeds, or naphthalene added before packing in tin boxes. Cones of conifers, which open when dry, must be tied up with string, so that they cannot lose seeds on the way. Soft fruits are placed in bottles with alcohol, rum, salt water or a 5 p.c. formaldehyde solution. Fruits and succulent plants may likewise be kept in alcohol or formaldehyde for several hours and then wrapped up in cotton wool, impregnated with said preservatives.

Another part of the article refers to the collection of material for herbariums. As a general rule, only complete material ought to be taken, *i.e.,* plants with flowers and fruits. When drying, the universally known rule is to be followed to press little at the beginning and a little harder later on, but to avoid too much pressing altogether. It is of great importance sometimes for later investigation to have some flowers preserved in alcohol, formaldehyde, or salt water.

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[10] *Kew Bull.,* 1914, 97.

A method recommended by Schweinfurth is complicated, it is true, but affords excellent results. The plants are placed between paper, as usual, and then put in layers into tin boxes, exactly described in the original, after alcohol has been poured over the whole. The tin boxes are then soldered, and the plants, which thus keep for a fairly long time, may be dried later on, when there is a favorable opportunity. This method has a very great advantage during rainy periods. It is self-evident that the material must be carefully labelled.

THE WORLD'S PRODUCTION OF ESSENTIAL OILS.

J. C. Umney [11] discusses the world's production of essential oils in a very exhaustive article. He indicates, for almost every country, which plants are grown and collected for the manufacture of volatile oils or might come into consideration for the purpose. It seems that he bases his inference on indications regarding the smell of the various plants, as are found here and there in books, so that many of his suggestions will presumably have no practical value. The article further contains statistics of the production and export of the most important essential oils.

OCCURRENCE OF FRAGRANT PLANTS IN HAWAII.

In the same periodical, we find an article [12] on the occurrence in Hawaii of a plant smelling like violets and which is called there either "*Pakalang*" or "Chinese violet." Holmes presumes that this plant is *Pergularia fragrantissima*, an *Asclepiadacea*.[13] The aromatic principle of the flowers can be extracted by way of "enfleurage." In addition, a plant referred to as "*Mulang*" is cultivated, which most likely is identical with the champaca shrub (*Michelia Champaca*). *Acacia Farnesiana* likewise occurs in Hawaii under the name of "*Klu*." E. V. Wilcox [14] points out the possibility of using this plant for the manufacture of scents.

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[11] *Perfum. Record*, 5 (1914), 164.

[12] *Ibid.*, 5 (1914), 130.

[13] The *Index Kewensis* does not mention this species, but *P. odoratissima*, Sm., probably indigenous in Farther India and which is largely cultivated in East Asia and East India on account of its sweet smelling flowers.

[14] *Americ. Perfumer*, 9 (1914), 75.

PEPPERMINT OILS.

W. Himmelbaur[15] reports on deterioration and subsequent disease of *Mentha* plantations. It was a question of slips of *Mentha piperita* (L. *ex parte*) Huds. var. *officinale,* Sole, which were grown in a long and narrow border in an experimental nursery in Prague. The location was unfavorable, inasmuch as on one side it was only 1.5 m. distant from a high wall, and was shaded on the other side by a high tree. Moreover, the whole plantation was quite close to inhabited buildings. Another cultivation experiment was carried out in Korneuburg, where *Mentha arvensis* f. *piperascens,* Mal. (= *canadensis* f. *piperascens,* Briq.) had been planted. The plot of ground was quite unshaded, but in close proximity to some gas works. Moreover, the situation in general was rather dry and exposed to the winds. In the beginning of August a weakening of the growth made itself felt in consequence of these unfavorable conditions. In Prague, damage through smoke first, and later an attack of *Puccinia Menthæ,* the well-known fungus disease, were noticeable; in Korneuburg, however, the attack of *Puccinia Menthæ* set in first, and damage by smoke later on. Himmelbaur describes the progress of the disease with many illustrations. As compared with healthy plants it was noticed that the leaves showed little drops of a yellow substance, and many crystals. The former consisted of fatty oil, the crystals presumably of the glucoside hesperidin contained chiefly in the *Rutaceæ.* Under normal conditions these two bodies do not occur in *Mentha* in such abundant quantities.

The chief damage to be noticed was the reduction in the activity of the chlorophyll apparatus. As a further noticeable symptom of the deep-seated disturbance, the superabundance of bodies such as hesperidin is to be mentioned. Hesperidin must be looked upon as a vegetable dross in the process of metabolism, as it is never taken up again. Simultaneously all protective bodies against fungi are affected, so that an attack of fungi may easily take place or that the resisting power against damage by smoke is reduced. Quickly passing smoke does not hurt healthy plants.

As the author correctly observes, the peppermint plant is rather particular as regards location and condition of soil. It requires a moderately moist and at the same time light and sunny situation, protected from wind.

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[15] *Zeitschr. f. d. landwirtsch. Versuchswesen in Österreich,* 1914, No. 3/4.

A. Wöhlk[16] reports on comparative examinations of some peppermint oils of commerce along with control tests of the ordinary menthol determination. As the results of his experiments, as admitted by himself, do not contribute anything new to the chemistry of peppermint oil, we need only mention that, according to Wöhlk, peppermint oil may be rectified *in vacuo* without material loss, but that this process offers no advantage over ordinary distillation by steam.

The indifferent results obtained occasionally in the determination of ester as well as of total menthol in peppermint oil are perhaps due, according to H. W. Redfield,[17] to insufficient cooling when boiling the oil with acetic acid anhydride or with alcoholic potash lye, whereby possibly some of the ester may escape through the condenser and so become lost for determination purposes. In order to arrive at a definite conclusion, Redfield made some comparative tests, using different reflux condensers for the experiment in question. He used an Allihn, a Chamot-Soxhlet and a Fritz Friedrichs condenser. The results with the two last-named condensers were identical, whereas the Allihn apparatus was evidently insufficiently cooled, for the percentage of total menthol was 4.87 p.c. below the values ascertained by means of the other instruments; with ester menthol the difference amounted only to 0.33 p.c.

PEPPERMINT OIL, JAPANESE.

The Japanese Parliament[18] has had to deal with a bill which, if not actually a monopoly, amounted as a matter of fact to little less than the placing of peppermint business under effective state control The proposed bill in its main features runs as follows:

Persons occupied in the cultivation, manufacture and sale of peppermint are to form coöperative production societies, in accordance with the terms of the act on coöperative production societies.

All persons who have not joined any of these coöperative production societies shall be prohibited from taking part in the cultivation, manufacture, or sale of peppermint.

If the peppermint coöperative production societies contemplate the export of peppermint, they shall be obliged to join in unions for their respective districts, and to establish a central union in Tokyo.

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[16] *Berichte d. deutsch. pharm. Ges.*, 24 (1914), 292.

[17] *Journ. Ind. Eng. Chemistry,* 6 (1914), 401.

[18] *Nachr. f. Hand., Ind. u. Landw.*, 1914, No. 51, p. 5.

Evidently the object aimed at with this act is to create a central body comprising all domestic peppermint producers and dealers, so as to enable them to make a firm stand against the peppermint exporters. In this manner it is hoped to prevent the latter, comprising only about 3 to 4 firms, from forming a ring with a view to regulating purchase prices, a combine against which the farmers would be powerless.

The bill was brought in but a few days before the close of the session. Whether it will make its appearance once again next session remains to be seen. As the adoption of such an act would undoubtedly make its influence felt on the course of prices of peppermint, parties interested in this article will follow the fate of the bill with particular attention.

According to K. Irk,[19] the Japanese peppermint grows very well in Hungary. He succeeded in propagating slips of *Mentha canadensis* var. *piperascens,* obtained from Berlin-Dahlem in 1911.[20] The oil distilled in 1913 from herb produced by slips had the following properties: $d\frac{25^\circ}{4^\circ}$ 0.8968; n_{D25° 1.4606; ester v. 196; ester menthol 5.54 p.c.; free menthol 75.58 p.c.; total menthol 81.12 p.c. The herb grown from seeds yielded an oil showing a_D -34.14° and containing 76.01 p.c. of total menthol. As will be seen, plants grown from seed contain less menthol than those reared from slips.

CURRENT LITERATURE.

Experiments with House-fly Baits and Poisons.

A. W. Morrill (*Jour. Econ. Ent.*, 7 (1914), No. 3, pp. 268–274) has conducted a number of experiments and draws the following conclusions: Vinegar in itself is an excellent bait for a fly trap, but when used with sugar or bread its attractiveness to flies is greatly increased. Equal parts of vinegar, sugar, and water appear to be approximately as attractive as equal parts of sugar and vinegar. An attractive combination poisonous to flies can be made with formalin and vinegar, but further tests are necessary to determine the best proportions. Formalin (40 per cent.) differs greatly on different days in its attractiveness to flies. This variation is evidently not due directly to temperature conditions, and it suggests the possibility of the flies themselves differing from day to day in the degree of the sensitiveness of the sensory organs. . . . Beer, milk, and bread, in the order named, are excellent materials to use with formalin, increasing its attractiveness many times. . . . Commercial alcohol (95 per cent.) and water at the rate of 1 : 20 appears from the experiments to be of about equal value with formalin and water mixed at the rate of 1 : 10, both as to attractive power and killing effects.

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[19] *Pharm. Zentralh.*, 55 (1914), 459. See also p. 65 of this *Report.*

[20] *Comp. Report,* April, 1911, 92.

Colors in Food.

Food Inspection Decision 76 is hereby amended by striking out of the list of permitted dyes contained therein the words:

Yellow shade:
4. Naphthol yellow S.

and substituting therefor the words:

Yellow shades:
4. Naphthol yellow S.
94. Tartrazine.

Food Inspection Decisions 117 and 129 are also amended so that, hereafter, the coal-tar dyes which may be used in food, subject to the provisions of Food Inspection Decisions 76, 117, and 129, shall be the following:

Red shades:
107. Amaranth.
56. Ponceau 3 R.
517. Erythrosine.
Orange shade:
85. Orange I.
Yellow shades:
4. Naphthol yellow S.
94. Tartrazine.
Green shade:
435. Light green S. F. yellowish.
Blue shade:
692. Indigo disulfoacid.

W. G. McAdoo,
Secretary of the Treasury.
D. F. Houston,
Secretary of Agriculture.
William C. Redfield,
Secretary of Commerce.

Washington, D. C., January 11, 1916.

CHEMICALS, DRUGS, AND DYES IN AMERICAN IMPORT TRADE.

Imports of chemicals, drugs and dyes into the United States showed an aggregate value of \$5,709,141 during November and of \$75,851,879 during the eleven months ending with November, 1915, thus making the year's indicated total approximately \$80,000,000, compared with \$87,675,573 in 1914 and \$101,292,697 in 1913. The following table, compiled by the Bureau of Foreign and Domestic Commerce, Department of Commerce, compares the imports during eleven months of 1915 with a like period of 1914 and indicates the extent to which quantities in most lines have fallen off and prices risen during the past year. Argols and gums are the only important exceptions to the rule of diminished quantities of imports in this group.

ELEVEN MONTHS' IMPORTS OF CHEMICALS, DRUGS, DYES, AND MEDICINES.

Articles imported		1915	1914	1915	1914
		Quantities, in millions		Values, in millions	
Acid, Carbolic	Pounds.	1.9	6.5	\$0.1	\$0.4
Acid, Oxalic	Pounds..	1.9	7.8	.1	.4
Alizarin	Pounds..	3.1	4.2	.8	1.2
Argols	Pounds..	28.5	25.1	3.2	2.7
Arsenic and orpiment	Pounds..	3.3	3.9	.1	.2
Cinchona bark	Pounds..	3.6	3.6	.5	.5
Cinchona alkaloids	Ounces..	1.1	2.5	.5	.6
Aniline salts	Pounds..	.3	2.1	.1	.2
Coal tar colors		..	..	3.2	6.4
Coal tar distillates		..	..	.7	1.3
Creosote	Gallons..	34.1	47.2	2.7	2.9
Extract, quebracho	Pounds..	80.5	98.9	3.0	2.7
Extracts, other tann'g	Pounds..	5.4	7.4	.2	.2
Fusel oil	Pounds..	3.6	3.4	.9	.5
Glycerin, crude	Pounds..	15.2	24.3	1.9	3.1
Camphor, crude	Pounds..	3.0	3.2	.8	.9
Camphor, refined	Pounds..	1.0	0.9	.3	.3
Chicle gum	Pounds..	7.4	5.5	2.7	2.0
Copal, kauri and damar	Pounds..	28.8	26.5	2.5	2.8
Gambier (Terra Japonica),	Pounds..	9.3	11.7	.4	.4
Indigo	Pounds..	6.1	7.8	2.8	1.1
Iodine	Pounds..	.5	.4	1.0	.9
Lactarene or caseine	Pounds..	6.8	9.5	.4	.6
Licorice root	Pounds..	47.8	100.1	1.1	1.8
Lime chloride	Pounds..	7.2	33.0	.1	.3
Lime citrate	Pounds..	8.3	4.2	1.1	.2
Magnesite, calcined	Pounds..	53.5	223.3	.4	1.2
Opium, 9 per cent. or more Morphine	Pounds..	.3	.4	1.6	1.7

ELEVEN MONTHS' IMPORTS OF CHEMICALS, DRUGS, DYES, AND MEDICINES. (*Continued.*)

Articles imported		1915 Quantities, in millions	1914 Quantities, in millions	1915 Values, in millions	1914 Values, in millions
Potash salts	Pounds	14.2	28.3	.8	1.2
Sodium nitrate	Tons	.7	.5	21.6	14.5
Sodium cyanide	Pounds	4.2	(a)	.7	.4
Sodium salts, other		..	..	.4	.6
Sumach	Pounds	14.5	12.1	.3	.3
Vanilla beans	Pounds	.8	.8	1.3	2.1

(a) For six months to December 31, 2.4 millions.

There were also imported during eleven months of 1915, 53,513 tons of logwood, valued at $725,000, against 32,430 tons, value $410,000, in 1914; and 19,555 tons of other dyewoods, value $300,000, as against 7743 tons, value $116,000, in the same period of 1914.

SECOND PAN-AMERICAN SCIENTIFIC CONGRESS.

ABSTRACTS OF PAPERS ON APPLIED CHEMISTRY.

TANNING MATERIALS FROM NATIVE SOURCES IN LATIN-AMERICAN COUNTRIES.

By THOMAS H. NORTON.

The growing scarcity of tanning materials in all countries of the North Temperate Zone has given rise to much anxiety as to what sources of tannin may be available in the early future. The attempt is made in this paper to catalogue and classify all of the tanniferous trees and plants of Latin America which promise to be eventually of industrial value. It is found that the flora of that section of the globe includes no less than 143 such sources of tannin, nearly all of which contain higher percentages than the oak or the chestnut.

The list embraces 12 woods, 102 different barks, 9 varieties of leaves, 3 roots, and 17 varieties of fruit and seeds. Among the woods, the quebracho of Argentina and Paraguay stands preëminent. The value in 1913 of the annual export of logs and of extract was $9,963,000, divided equally between the two forms. The supply is practically inexhaustible. Were quebracho capable, alone, of producing good grades of all varieties of leather, the problem of the world's supply for many years to come might be considered as solved, but it can yield good results only when used with other tanning materials.

Of the latter, the most important at the present time are the mangrove bark of Colombia, Venezuela, and Brazil; the cascalote, divi-divi, and similar pods of Colombia and Mexico; the canaigre and sumach of Mexico; the algarobilla of Chile; and the rhatany of Peru. All of the above sources are capable of extensive development.

The barks of the vast forests of Argentina, Brazil, and Paraguay seem destined to become in the near future one of the world's leading sources of tannin. There is in them a great diversity of forms of tannin, providing for all needs, and, besides, the tannin content of many varieties is far superior to the average percentages present in the oak barks, and the hemlock bark of North America and Europe.

The different trees and plants susceptible of furnishing tannin in commercial quantities are described in detail.

The monograph offers the first comprehensive survey of the tanniferous flora of Latin America.

DYESTUFFS FROM MATERIALS NATIVE TO LATIN-AMERICAN COUNTRIES.

By Samuel P. Sadtler.

This paper deals with the extraction of dyes from vegetable and animal sources, such as dyewoods and certain color-yielding insects, as over against the manufacture of the synthetic or coal-tar dyes. Neither in Latin America nor in North America has the synthetic dye-color industry as yet been established upon so firm a commercial basis as to enable it to compete with the European dyestuff industry, although the present great war in Europe may, among other results, bring about such a result upon this side of the Atlantic.

The use of dyes of vegetable and animal origin long antedated the use of the synthetic dyes, and, indeed, down to the middle of the last century, when in 1856 Perkin discovered mauve, the first of the aniline dyes, the former were alone available.

The vegetable sources of the natural dyes are trees, shrubs, leaves and roots of plants. From these the dyestuffs are extracted by water or aqueous solvents, either with or without previous fermentation to decompose natural combinations like glucosides and liberate the dyestuff proper. These dyewoods and dye-yielding plants almost without exception are natives of tropical and semitropical countries, and some of the most important of them are especially to be found as natives of the Latin-American countries.

In taking up the vegetable and animal dyestuffs obtained from materials native to Latin-American countries from review, they are grouped according to color and their nature and occurrence described, together with their general uses. A table of natural dyestuffs with the artificial colors that have been used as substitutes, whether because of cheaper prices or their being faster to light and the action of reagents, is also given at length, as well as figures on production and imports into the United States.

THE NITRATE INDUSTRY.

By Enrique Cuevas.

Caliche, the raw material from which the nitrate of commerce is extracted, was discovered in the great desert of northern Chile by the Indians some time in the seventeenth century. The first nitrate company was organized in 1812 with very crude reduction methods employed. The present era in the industry dates from 1855 with the introduction of steam as a means of heating and evaporating the solutions.

In 1873 the Peruvian Government assumed a monopoly of the nitrate lands and made grants in a careless manner. This led to much difficulty encountered by Chile when that country was left in possession of this area at the close of the Pacific war. However, titles have since been generally cleared up and beneficial laws enacted, covering not only the matter of land disposal, but of labor and other important questions.

According to the latest official report of the inspector-general of the nitrate deposits, the zone of nitrate-bearing ground comprises 200,000 square kilometres, of which less than 3 per cent. has been surveyed and prospected. In this surveyed portion alone there remains enough nitrate to supply the world for an additional 100 years, measured at the present rate of production. These calculations have been made on an extremely conservative basis, and take no account whatever of known areas of low-grade material.

The industry is divided into two principal operations: (1) mining and transportation of the crude material, and (2) production of nitrate. Methods employed in both branches leave room for improvement. Under present practice, considering average value of raw material, wages, etc., the cost of producing commercial nitrate is estimated at 50 cents United States currency per quintal (101.44 pounds).

Trade specifications require a content of nitrate of sodium equal to at least 95 per cent. This is used as a fertilizer. The refined product, with over 96 per cent. nitrate of sodium, is applied in manufacturing uses, such as glass, explosives, fusing mixtures, nitric acid, etc.

There can be no competition between Chilean nitrate and atmospheric nitrate under any conditions which may be foreseen at present. The deposits of the great Pampa Salitrera (nitrate plain) are too vast and the business of manufacturing and marketing the material is too well systematized, whereas atmospheric-nitrate manufacture exists under too many limitations.

A natural reduction in nitrate production has followed the outbreak of the European war, many of the important consuming markets having been cut off.

The author has appended detailed data regarding nitrate production, method of transacting nitrate sales, results of experiments showing the advantages of using nitrate of sodium as a fertilizer, with special reference to crops raised in the United States, and other items of value covering the entire field.

PETROLEUM AND ASPHALT IN THE UNITED STATES.

By E. W. Shaw.

Petroleum is found in the United States in three general regions, eastern, south-central, and western, each of which has access to the sea by one or more pipe lines. The bulk of it is found 800 to 2500 feet below the surface, and more of it is below than above sea level. Its relations to rock pores, to hydraulic forces, and to the chemical nature of the rocks involve most interesting scientific problems. Geology is being found of considerable use in the search for petroleum, the most important and generally applicable principle being that more oil is found on anticlines than in synclines.

The oil shows great variety. Some has little or no asphalt or objectionable sulphur, and others much. Some is dark and heavy, and some transparent and light. Most of the oil is refined by distillation, but processes are coming into general use which involve chemical changes, leading to increased percentages of lighter and more valuable products.

The annual production is steadily increasing, and now (1915) amounts to nearly 300,000,000 barrels; California is the leading state, but others are close competitors. Of this amount 4,000,000 or 5,000,000 barrels are exported in an unrefined condition. The exports of refined products amount to over 5,000,000 barrels a year. New pools are continually being discovered, but the supply of petroleum is obviously not inexhaustible, and perhaps in less than a century the demand will greatly exceed the output and prices will be forced to much higher levels. With higher prices no doubt more careful methods of production and handling will be put into use.

Asphalt is of comparatively minor importance, though it is widely distributed. Most of the home-produced asphalt is a residue from oil refining.

CHEMICAL RESEARCH AS A DIRECTING AID IN THE EFFICIENT UTILIZATION OF PINE FORESTS.

By Charles H. Herty.

The pine forests of the southern United States present unusual features because the long-leaf pine is the source of turpentine and resin. The resinous character of the pine led to the belief, until recent years, that it was unsuited to the manufacture of pulp and alcohol. This belief led to prodigal waste.

As the exploitation of the forests spread from the Atlantic seaboard into Florida and the more western states it began to be apparent that complete destruction of a great natural resource was imminent, and heed was given to the criticism of a chemist that in the methods employed for the collection of crude turpentine the trees were injured, and there was a diminution in the amount of turpentine recovered as well. Tests conducted by the United States Forest Service showed that trees correctly cut yielded 25 per cent. more product. The results were the replacement of the " box " system by the " cup and gutter " system of collecting, and other important improvements. In carrying out the experimental work which demonstrated the waste in the old process the strictest methods of laboratory research were followed.

The trees or parts of them which fall to the ground are also sources of resinous products. The addition of the wood-pulp feature promises a successful settlement of the industry of extracting products from this "lightwood," of which 2,500,000 cords are formed annually in the long-leaf pine forest, aside from the pine stumps.

It has been shown that the long-leaf pine is suitable for paper manufacture and that sawdust has been utilized under boilers; but greater advancement is promised by results of chemical research, and the commercial application of these results has already begun.

In the light of the accumulated results of such research the waste in former commercial utilization of pine forests is almost unbelievable. The lack of knowledge and economic conditions provided some excuse for the losses of the past, but the nation of to-day will be profligate which fails to utilize to the fullest extent up-to-date methods in the exploitation of the pine forests.

FOOD AND EFFICIENCY.

By H. W. Wiley.

The human body is a chemical laboratory in which all the reactions that take place are capable of exact measurement. Just as the efficiency of a steam engine depends upon the perfection of its work and the character of the fuel, so does the efficiency of the human body depend upon the perfection with which it is elaborated and built and the character of the food which activates it and provides it with heat and energy. The perfection of the building of the human body depends, first of all, upon the proper nutrition of the infant and the child. The chemist has determined by careful experimental work the nature of the fuel required for activating the human engine, and has established the proportions in which the various components of the fuel should be administered to secure the greatest efficiency.

As the object of every life is efficient work, the good condition of the machine is fundamental in securing individual efficiency. Of all the factors that tend to interfere with physical efficiency, bad food is the most dominant. If infants and children are not well fed their teeth are imperfectly formed. The fearful ravages in individual efficiency effected by bad teeth are not at all appreciated as they should be. If we were conscious of the damage that imperfect teeth are doing we would use every endeavor to have the threatening danger removed.

The introduction into every home of a proper diet would do much toward warding off disease, establishing stability of the physical frame, and improving intellectual and moral attitudes. It would also make more efficient men and women, promote happiness and welfare, and prolong life.

Those who desire to see a prosperous country devote themselves with all ardor to improving the character of the food supply and excluding from consumption the alcohol, tobacco, and other drugs which so debase both body and mind. To this end the chemist is constantly working in his laboratory and through his investigations making it possible to so order human diet as to secure the maximum of human efficiency.

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THE POSSIBILITY AND VALUE OF IMPROVING THE COMMERCIAL BELLADONNA CROP THROUGH SELECTION.*

By ARTHUR F. SIEVERS, Chemical Biologist, Office of Drug-Plant Investigation, Bureau of Plant Industry, Washington, D. C.

The changes in trade relations of the United States which are expected to result from the European war will undoubtedly lead to the establishment here of industries the products of which have heretofore been imported from abroad. Among such industries may be mentioned the commercial growing of medicinal plants, and the impetus which war conditions have lent to such enterprises is already plainly felt. The sole source of many of our important drugs lies in that section of the world which is at present, and will be for some time to come, entirely unable to furnish the supply necessary for local consumption, and the result has been a steady rise in prices as the shortage has become more and more acute. Such prices have, as was to be expected, attracted attention to the possibility of domestic production of such products, and the efforts being made in that direction may lead to the establishment of permanent industries even after economic readjustments in Europe have resulted in more normal prices for such products.

The growing of drug plants differs greatly from the growing of the staple farm crops. In the first place, it requires an expert knowledge of a large number of plants, many of which are probably entirely unknown to the average agriculturist. The demand for any one plant is limited, and diversified farming would be necessary. Some of the plants can be grown only in limited areas in this country, and the methods of cultivation, harvesting, and preparation of the marketable product require an expert knowledge of the habits and nature of the plants themselves and a thorough understanding of the proper methods to be employed to bring the crops into such condition as will make them acceptable to the trade. It will be seen, therefore, that such an undertaking has little in common with the growing of wheat, corn, or other common farm crops.

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* Published by permission of the Secretary of Agriculture.

It is to be expected that the enterprise will be undertaken by four different groups of individuals: First, the back-yard enthusiast who expects to make large profits from his idle back-yard by growing a few medicinal herbs at his leisure and selling them at fancy prices; second, the farmer who plans to devote a small area of his farm to the same purpose incidental to his general farming; third, the individual or corporation that would make a special business of drug-plant cultivation with the aid of proper equipment and scientifically-trained men; and, fourth, the pharmaceutical manufacturers who would undertake the work for the purpose of producing the raw material required in their business and thus make themselves independent of the crude drug market.

This paper deals with the cultivation of belladonna, not from the agricultural standpoint, but from the standpoint of plant breeding and the improvement of the therapeutic quality of the drug produced by means of recognized methods of selection. Here again the problem involved differs greatly from the methods of selecting such crops as corn and other cereals. In the latter case the average farmer can select his seed readily by choosing the best ear of corn or head of wheat merely by physical characteristics. This, at least, will determine the yield per acre, which is the main factor in his profit. With a medicinal plant like belladonna, however, the quality of the product, from a therapeutic standpoint, cannot be determined by physical appearances, but requires chemical analyses. To make these analyses laboratory facilities and trained analysts are necessary. It is true, a physical selection may result in increased tonnage per acre, but the present tendency is to base the value of the crops on its alkaloid content. It is evident that methods of selection of alkaloid productiveness cannot be made by small growers included in groups one and two mentioned above, and the subject of this paper is therefore presented with a view to interesting the larger growers who have the facilities to make the analyses that are necessary.

It may not be amiss here to point out in what way the production of plants with a high alkaloid content is of great importance to the grower. The great bulk of belladonna used in this country is bought as raw material for the manufacture of pills, plasters, tinctures, fluidextracts, and for the manufacture of the pure alkaloids. It is of vital concern to the manufacturer of these products whether his raw material is high or low in alkaloids. While the Pharmacopœia guards against inactive material by requiring a minimum of 0.3 per cent. of alkaloids in the leaves, the large consumer is anxious to have the percentage as much above that as obtainable, because the greater the percentage of alkaloids in the raw material, the less material will be required to produce the finished product of the standard strength. The handling of less material will in turn result in a saving in the cost of manufacturing the products. It is evident, therefore, that the belladonna rich in alkaloids will command a better price.

The possibility of greatly adding to the value of crops of medicinal plants by increasing their active constituents by methods of selection led the Office of Drug-Plant Investigations of the United States Department of Agriculture to undertake a general study of this subject. While it was hoped that eventually something of benefit might be accomplished here, it was necessary to undertake a thorough experiment with a single plant as a start in order to demonstrate the feasibility of the plan. Belladonna was selected as a suitable plant for a number of reasons. It is an important plant and the supply from foreign sources is becoming more and more unsatisfactory, making domestic cultivation a necessity. It is readily cultivated and is thus well adapted to experimental purposes. It is a perennial, which fact makes it possible to study its constituents through a number of seasons, thereby getting a better basis for selection by eliminating to a great extent seasonal influences. Finally, its active constituents being alkaloids which can be definitely assayed by chemical means, a precise quantitative study of such constituents can be made.

The first step undertaken was to determine the range of variation in the percentage of alkaloids in individual plants; also the extent to which such variation is influenced by factors affecting the growth and cultivation of the plant. The quantitative study of the alkaloids was to be supplemented by a corresponding study of the physical or botanical characteristics of each individual in order to establish the relationship, if any, which exists between the physical and chemical characteristics of the plant.

In order to make the alkaloid determination for each plant some modification of the official method was necessary, owing to the smallness of the sample. In some cases only two grammes of dry material were available for the assay. In all cases the leaves were thoroughly air dried and then kept in a desiccator over sulphuric acid for 24 hours. The official method was modified as follows: The sample, from two to five grammes in weight, was placed in a 200-c.c. Squibbs separatory funnel, in which the maceration and percolation were done, thus avoiding the transfer of the material from a macerating flask to the percolator, thereby eliminating a serious source of error and saving a great deal of time.[1] For each gramme of material used 1 c.c. of dilute ammonia water was added.[2] The prescribed 50 c.c. of menstruum was added to start with, but the percolation was performed with three portions of 20 c.c. each to insure complete extraction.[3] The remainder of the process was in accordance with the Pharmacopœia.

In the summer of 1909 three rows of belladonna plants were started at Arlington, Va. They made a fair growth by fall, but failed to develop any seed. The following year they made a good growth, and 24 individual plants were staked out. They are designated as first-year plants, owing to their late start the preceding year. The only picking made from these plants in 1910 was in June, when they were in full bloom. When referring to this and subsequent pickings reference is made to leaves only.

Of the 24 plants, 1 assayed less than 0.400 per cent. alkaloids, namely, 0.334 per cent.; 7 less than 0.5 per cent., namely, 0.412, 0.440, 0.459, 0.462, 0.473, 0.485, 0.495 per cent.; 8 less than 0.6 per cent., namely, 0.503, 0.528, 0.536, 0.544, 0.555, 0.563, 0.587, 0.587 per cent., and 8 more than 0.6 per cent., as follows: 0.603, 0.618, 0.623, 0.645, 0.656, 0.657, 0.667, 0.700 per cent.

RESULTS ON SECOND AND THIRD YEARS' CROPS.

The first year's study having revealed a large variation in the alkaloidal content of individuals, a total of 59 plants was staked out in 1911, the original 24 and 35 additional in the same field. During this and the following season five pickings were made of all the individuals large enough. The first picking was made the second week

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[1] A. F. Sievers, *Merck's Report*, Aug., 1910, p. 215.

[2] A. F. Sievers, *Journ. A. Ph. A.*, March, 1912, pp. 199–200.

[3] A. F. Sievers, *Ibid.*, March, 1912, pp. 199–200.

TABLE I.

Percentage of alkaloids in the leaves of individual belladonna plants at different stages of growth in 1911 and 1912.

Plant No.	Season of 1911						Season of 1912					
	Alkaloids (per cent.)						Alkaloids (per cent.)					
	First picking (May 12)	Second picking (May 22)	Third picking (June 17)	Fourth picking (Sept. 6)	Fifth picking (Oct. 17)	Average for season	First picking (May 10)	Second picking (May 21)	Third picking (June 18)	Fourth picking (Sept. 10)	Fifth picking (Oct. 17)	Average for season
1	.....	.....	.....	0.823	0.687	0.755	.....	0.332	0.503	0.653	0.417	0.501
2	0.852	0.698	0.583	.804	.619	.711	.....	.558	.700	.407	.606	.568
3	.384	.375	.277	.549	.451	.407	.....	.393	.448	.448	.....	.429
4	.461	.334	.304	.824	.665	.518	0.522	.557	.469	.654	.591	.559
5	.493	.700	.478	.681	.546	.579	.....	.438	.....	.510	.....	.474
6	.484	.....	.371	.630	.610	.524	.462	.415	.....	.548	.465	.472
7	.714	.622	.440	.765	.470	.602	.....	.424	.447	.689	.296	.464
8	.520	.618	.423	.891	.528	.596	.....	.....	.652	.726	.....	.689
9	.....	.627	.460	.781	.452	.580	.560	.384	.402	.501	.....	.429
10	.382	.344	.450	.671	.670	.503	.....	.421	.438	.457	.....	.420
11	.699	.677	.567	.537	.618	.619	.....	.388	.609	.692	.223	.499
12	.649	.782	.693	.497	.584	.641	.767	.631	.685	.715	.308	.638
13	.614	.627	.626	.763	.563	.639	.495	.479	.655	.472	.394	.518
14	.480	.556	.474	.476	.455	.488	.553	.421	.457	.359	.488	.420
15	.452	.....	.562	.546	.418	.494	.641	.531	.567	.462	.310	.550
16	.455	.754	.624	.622	.592	.609	.716	.631	.545	.....	.....	.631
17	.487	.....	.534	.396	.474	.473	.684	.591	.559	.....	.....	.611
18	.477	.645	.481	.634	.519	.551	.553	.386	.662	.....	.....	.534
19	.356	.386	.356	.507	.532	.427	.560	.423	.475	.....	.....	.486
20	.....	.489	.795	.509	.479	.568	.....	.676	.681	.....	.....	.678
21	.....	.535	.633	.669	.684	.630	.732	.719	.781	.....	.....	.744
22	.423	.410	.428	.454	.557	.454	.703	.593	.462	.....	.....	.586
23	.....	.348	.354	.487	.425	.403	.496	.366	.341	.....	.....	.401
24	.....	.349	.392	.....	.....	.370	.....	.....	.....	.....	.....	.....
25	.....	.277	.335	.....	.....	.306	.521	.438	.508	.....	.....	.489
26	.395	.378	.527	.797	.733	.567	.869	.700	.609	.....	.....	.726
27	.....	.287	.432	.554	.495	.442	.754	.693	.521	.....	.....	.656
28	.304	.392	.513	.740	.614	.513	.657	.535	.525	.....	.....	.572
29	.....	.655	.914	.908	.547	.756	.737	.647	.729	.....	.....	.704
30	.387	.573	.512	.653	.527	.530	.655	.553	.507	.....	.....	.572
31	.381	.430	.458	.669	.384	.464	.....	.....	.....	.....	.....	.....
32	.409	.425	.546	.703	.549	.526	.533	.446	.646	.....	.....	.542
33	.481	.447	.549	.496	.458	.486	.602	.589	.576	.....	.....	.589
34	.335	.....	.526	.532	.200	.414	.....	.292	.520	.....	.....	.406
35	.323	.476	.534	.768	.524	.430	.608	.596	.732	.590	.549	.616
36	.320	.468	.482	.488	.473	.446	.469	.418	.598	.555	.378	.483
37	.323	.423	.550	.719	.558	.515	.598	.442	.475	.705	.523	.548
38	.532	.514	.552	.749	.630	.595	.454	.463	.520	.586	.....	.506
39	.303	.262	.327	.614	.451	.391	.404	.365	.525	.600	.....	.473
40	.405	.395	.....	.797	.644	.560	.575	.556	.469	.....	.....	.533
41	.318	.390	.456	.562	414	.428	.508	.512	.524	.470	.332	.469
42	.494	.526	.497	.615	.528	.533	.617	.664	.648	.789	.....	.679
43	.515	.567	.534	.547	.331	.499	.506	.305	.698	.562	.....	.533
44	.342	.497	.448	.626	.550	.489	.458	.....	.467	.....	.....	.463
45	.467	.410	.428	.759	.379	.488	.601	.501	.382	.430	.384	.460
46	.337	.285	.308	.588	.431	.390	.418	.334	.480	.483	.314	.406
47	.389	.422	.400	.573	.482	.453	.....	.479	.572	.449	.522	.505
48	.494	.493	.539	.748	.....	.568	.426	.346	.590	.567	.332	.452
49	.583	.476	.....	.668	.505	.558	.556	.476	.457	.578	.390	.481
50	.610	.583	.447	.619	.379	.527	.....	.361	.328	.420	.....	.353
1w	.638	.835	.587	.738	.612	682	737	.642	.777	.....	.....	.719
2w	.444	.769	.614	.311	.518	.531	.573	.544	.563	.....	.....	.560
5w	.464	.....	.741	.638	.595	.584	.741	.602	.524	.806	.647	.664
6w	.596	.879	.925	.711	.722	.766	.847	.747	.882	.804	.558	.768
7w	.558	.831	.832	.727	.571	.704	.782	.666	.646	.694	.573	.672
8w	.578	.717	.538	.570	.481	.577	.634	.453	.280	.505	.....	.468
9w	.487	.767	.553	.425	.337	.514	.557	.429	.638	.....	.....	.541
10w	.587	.763	.690	.473	.424	.587	.751	.478	.505	.639	.678	.610
11w	.425	.521	.373	.479	.420	.444	.773	.562	.430	.402	.....	.544
Average	.472	.528	.517	.633	.519	.532	.601	.503	.553	.568	.447	.545

in May, before many flowers had appeared. The second picking was made about two weeks later, when the plants were in full bloom, and the third picking during the third week in June, when the berries were well developed. At the time of the fourth picking, early in September, the plants had assumed their characteristic late summer appearance. The berries were ripe and the leaves were small and sparse. Later in the fall new leaves appear on the plants, and it was at this stage, during the third week in October, that the fifth and last picking was made. Table I gives the results of the analyses.

RELATION OF THE ALKALOIDAL CONTENT OF THE LEAVES TO THE STAGE OF GROWTH OF THE PLANT.

Opinions have been expressed from time to time as to the proper stage in the growth of the belladonna plant at which the leaves should be picked in order to insure the greatest percentage of alkaloids. Owing to the standard required by the Pharmacopœia, this is a question of no small economic importance. Gerrard[4] has found that the plant is not rich in alkaloids before flowering, but that the full development is reached at the period of flowering, and is maintained in both the roots and leaves into the fruiting season.

The large number of assays of the leaves of individual plants here involved presents exceptional opportunity for the study of the above question. The proper season for the picking of belladonna leaves does not, however, depend entirely on the percentage of active constituents present. This will become very evident when the data at

TABLE II.

Number of Belladonna Plants which Showed an Increase or Decrease in Percentage of Alkaloids in the Leaves at the Second, Third, Fourth, and Fifth Pickings as Compared with the Preceding Picking at Arlington Experimental Farm in 1911 and 1912.

Stage of growth	Season of 1911			Season of 1912		
	Total number of plants	Number of plants which showed—		Total number of plants	Number of plants which showed—	
		Increase	Decrease		Increase	Decrease
Second picking.......	70	38	32	59	16	43
Third picking........	60	25	35	53	34	29
Fourth picking.......	54	40	14	32	20	12
Fifth picking.........	56	8	48	23	4	19

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[4] Gerrard, A. W., "On the Alkaloidal Value of Belladonna Plants at Different Periods of Growth," *Yearbook of Pharmacy*, 1881–1882, pp. 400–404, 1882.

hand are thoroughly interpreted. Table II shows in condensed form the number of plants in which there was an increase or decrease in the percentage of alkaloids in the leaves at the various pickings.

Table II shows that in 1911 the leaves of most of the plants were richer in alkaloids at the second picking than at the first, which is in accord with the observations of Gerrard, already noted. In 1912, however, the opposite is true. It will be seen further that in the fourth picking of both years the greatest number of plants showed an increase in the alkaloidal content of their leaves. Referring to Table I, it is seen that in the fourth picking in 1911 the average quantity of alkaloids for the leaves of all the Arlington plants was 0.633 per cent., or more than one-tenth of 1 per cent. more than at the flowering stage. In 1912, at this same stage, the average was 0.568 per cent. of alkaloids, which is 0.065 per cent. higher than the average at the flowering stage. There appears to be but a slight difference, so far as the alkaloidal content is concerned, between the flowering stage and the early fruiting stage. At the last, or fifth, picking the plants had acquired much new growth and, judging from the average results, the percentage of alkaloids present in the leaves at that stage was not much different from the second and third stages.

RELATION OF SIZE AND APPEARANCE OF PLANTS TO ALKALOIDAL CONTENT OF LEAVES.

When this investigation was first undertaken it was hoped that some relationship might be found to exist between the physical appearance of the plants and the alkaloidal content of their leaves, for, should such relationship exist, the process of distinguishing between the good and the poor plants with regard to their active constituents would become a much simpler matter than by use of the assay method, since the latter is necessarily tedious.

The variations in the physical appearance of belladonna plants depend largely on the height and the number of stalks or stems. When height is referred to here, the actual length of the stems from the ground to the tips is meant rather than the vertical distance of the topmost branches from the ground. This distinction is necessary because many of the branches droop or grow at an angle. The spread of the plant,—that is, the distance around,—is largely dependent upon the angles at which the branches are growing and on the number of stems of the plant. The height of the plant and the number of stems, therefore, are the two distinguishing features as regards size. These indicate, also, the relative health and vigor of the plant. An attempt was made to differentiate between various types of leaves, with reference to size and color, and between different types as regards blooming and fruiting tendencies. It was found difficult, however, to find individuals which conformed definitely to any particular type. Where certain characteristics existed they were not, as a rule, general over the entire plant, but were usually found on only one side or on only certain stems. Thus, in some cases, one or two stems of a plant bore what appeared to be leaves of a larger size than usual and of a different shade of green, while the remainder of the plant was in every respect like most of the other plants. The same would be true of the number of flowers and berries. In such cases it could not be assumed that the plant represented any special type. It was also noticed that some of these distinctive features were subject to gradual changes, so that their distinctiveness was soon lost.

While the number of plants that have been under observation was probably not sufficiently large to show conclusively that there is no definite correlation between physical appearance and active medicinal properties in the leaves, yet from the data at hand such a condition is at least indicated. Henderson,[5] in commenting on the great variation in the alkaloidal content of different lots of belladonna roots, points out that appearance is no criterion of the quality, the best-appearing roots being often the poorest in medicinal value.

A few actual examples of the lack of relationship between the size of the plant and the alkaloidal content of its leaves may be of interest. The height and spread of all the plants was noted, and it was found that in 1910 plant No. 10, which was the largest in the list, was 42 inches in height and had a spread of 3½ by 4½ feet, yet it contained only 0.536 per cent. alkaloids, a trifle less than the average of all the plants. On the other hand, plant No. 8, which was only half as high and much smaller in spread, showed 0.657 per cent. of alkaloids in its leaves. Again, in 1911, plant No. 15 was the largest plant in the plot as regards height, yet its leaves contained only 0.494 per cent. of alkaloids. The same is true of plants Nos, 4, 43, 45, and 46, while, on the other hand, the leaves of the comparatively small plants, Nos. 21, 29, and 1w, contained 0.630, 0.756, and 0.682 per cent. of alkaloids respectively. In the following year these same plants failed again to compare favorably with others as regards size, yet the percentages of active constituents in their leaves stood out prominently above the average. There were, however, some plants larger and more vigorous than the average which also contained above the average percentage of alkaloids. The lack of correlation is therefore evident.

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[5] Henderson, H. J., " Percentage of Alkaloids in Belladonna Root," *Pharm. Journ.,* vol. 75, No. 3485 (Ser. 4, vol. 21, No. 1832), p. 191, 1905.

VARIATION AMONG INDIVIDUAL PLANTS.

The most important fact established thus far is the great variation in the quantity of alkaloids found in the leaves of individual plants. That some variation should exist was to be expected, since variations are often noted in the chemical constituents of different plants of many species.

To show the great variation found among the comparatively limited number of plants under observation, Table III is presented below.

TABLE III.

Range of Variation in Percentage of Alkaloids in the Leaves of Belladonna Plants at each Stage of Growth.

Stage of growth	Alkaloidal content of the leaves (per cent.)					
	1910		1911		1912	
	High	Low	High	Low	High	Low
First stage	......	......	0.852	0.303	0.869	0.404
Second stage	0.700	0.334	.879	.262	.747	.292
Third stage	......	......	.925	.277	.882	.328
Fourth stage	......	......	.891	.311	.806	.359
Fifth stage	......	......	.733	.200	.678	.296
Season average	......	......	.766	.306	.768	.353
Average	......	......	.841	.277	.792	.339

From this tabulation it appears that the active principle is more than three times as great in the leaves of some plants than in those of others at the same period of growth, although the plants are in the same plat and therefore grow practically in the same soil and under the same climatic conditions. Under such circumstances the existing variation can hardly be attributed to anything but the inherent characteristic of the individual plant. Much has been written concerning the influence of soil and climate on the formation of alkaloids in the plants. Gerrard[6] has found that a chalky soil favors the formation of atropin. Chevalier[7] concludes, from his experiments with fertilizers, that the alkaloidal content of certain Solanaceæ can be increased by means of nitrates and farmyard manures. Ransom and Henderson,[8] however, who are working along the line of Chevalier's experiment, have not found thus far that artificial manures materially affect the percentage of alkaloids in the dried leaf, but note in several cases a large increase in the yield of the green plant per acre. Carr[9] claims to have found a certain relationship between the amount of sunshine during the growth of the plant and the percentage of alkaloids found in the stems and leaves, claiming that plenty of sunshine and limited rainfall have a tendency to stimulate the production of alkaloids.

Although soil and climate may have considerable influence on the alkaloidal content of plants, yet to establish this as a fact beyond all doubt is a difficult matter because of the individual variation involved. Until experiments have been conducted upon a large number of plants which show a minimum variation in their alkaloidal content, nothing definite can be said upon this point. In working with a limited number of plants collectively, an abnormally low or high percentage of alkaloids in the leaves of a few might so affect the yield as to make the average entirely misleading. Likewise, this individual variation becomes an important matter in the sampling of large quantities of leaves and roots. In order to secure a reliable sample, it should be of considerable size and selected only after the leaves or roots have been thoroughly mixed.

The existence of great variations in individual plants having been established, the next question was whether such variations existed during only one growing season or manifested themselves in following seasons. If plants which are rich in alkaloids one season are correspondingly poor the following season, then it is logical to assume that the production of alkaloids in the plant is dependent on factors which change from year to year. If it were definitely known what rôle the alkaloids play in the metabolism of the plant, it might be easier to determine what factors influence their development. As has been shown, the physical appearance, or, in other words, the

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[6] Gerrard, A. W., "On the Alkaloidal Value of Belladonna Plants at Different Periods of Growth," *Yearbook of Pharmacy*, 1881–1882, pp. 400–404, 1882.

[7] Chevalier, J., "Influence de la culture sur la teneur en alcaloides de quelques Solanées," *Compt. Rend. Acad. Sci.* (Paris), T. 150, pp. 344–346, 1910.

[8] Ransom, Francis, and Henderson, H. J., "Belladonna: the Effect of Cultivation and Fertilizers on the Growth of the Plant and Its Alkaloidal Content," *Chemist and Druggist*, vol. 81, No. 1703, pp. 53–55, 1912.

[9] Carr, F. H., "The Effect of Cultivation upon the Alkaloidal Content of Atropa Belladonna," *Chemist and Druggist*, vol. 81, No. 1703, pp. 42–44, 1912.

Table IV.

Percentage of Alkaloids Above and Below the Average † in the Leaves of Individual Belladonna Plants at Arlington, Va., in 1911 and 1912.

[The figures given are based on the season averages of all the pickings. In each of the 40 plants designated by a star (*) the percentage of alkaloids above or below the average of the entire lot in 1911 varies by not more than one-tenth of 1 per cent. from that in 1912.]

Plant No.	Alkaloids above (+) or below (−) the average (per cent.)		Plant No.	Alkaloids above (+) or below (−) the average (per cent.)	
	1911	1912		1911	1912
1	+0.223	−0.044	31	−0.068	....
2	+ .179	+ .023	32*	− .006	−0.003
3*	− .125	− .116	33*	− .046	+ .044
4*	− .014	+ .014	34*	− .118	− .139
5	+ .047	− .071	35	− .102	+ .071
6*	− .008	− .073	36*	− .086	− .062
7	+ .070	− .081	37*	− .017	+ .003
8*	+ .064	+ .144	38*	+ .063	+ .061
9	+ .048	− .116	39*	− .141	− .072
10*	− .029	− .125	40*	+ .028	− .012
11	+ .087	− .055	41*	− .104	− .076
12*	+ .109	+ .093	42	+ .001	+ .134
13	+ .107	− .023	43*	− .033	− .012
14*	− .044	− .125	44*	− .043	− .082
15*	− .038	+ .005	45*	− .044	− .085
16*	+ .077	+ .086	46*	− .142	− .139
17	− .059	+ .066	47*	− .079	− .040
18*	+ .019	− .011	48	+ .036	− .093
19*	− .005	− .059	49*	+ .024	− .064
20*	+ .036	+ .133	50	− .005	− .192
21*	+ .098	+ .199	1w*	+ .150	+ .174
22	− .078	+ .041	2w*	− .001	+ .015
23*	− .129	− .144	5w*	+ .052	+ .081
24	− .162	......	6w*	+ .234	+ .243
25	− .226	− .056	7w*	+ .172	+ .127
26	+ .035	+ .181	8w	+ .045	− .077
27	− .090	+ .111	9w*	− .018	− .004
28*	− .019	+ .027	10w*	+ .055	+ .065
29*	+ .224	+ .159	11w*	− .088	− .001
30*	− .002	+ .027			

† Average for 1911, 0.532 per cent.; for 1912, 0.545 per cent.

vitality and growing power, of the plant appears to bear no definite relation to the development of alkaloids. Furthermore, if soil and climate are the potent factors, then their influence ought to be felt by all plants alike when all are grown on similar soil and in the same locality. Such, however, has been found not to be the case, and reference to the tables shows that there were plants rich and poor in alkaloids in every year during which the observations extended. On the other hand, if a plant with leaves containing an unusually high or low percentage of alkaloids in one season shows the same characteristics in following years, it is safe to assume that there is a definite tendency in that plant to produce a small or a large quantity of alkaloids in the course of a season's growth, just as in other plants there are well-defined tendencies toward physical characteristics. In order to show the extent to which the characteristic of each plant manifests itself through a number of seasons the following table is presented.

In the plants in Table IV there are a number which are conspicuous because of the high or low percentage of alkaloids in their leaves. Plants Nos. 3, 23, 34, and 46 are, without doubt, greatly inferior to the others from a medicinal point of view. On the other hand, Nos. 21, 29, 1w, 6w, and 7w are greatly superior to any others in the list. Furthermore, these plants manifested the same char-

TABLE V.

Alkaloidal Content of the Leaves of Belladonna Plants, Rich and Poor in Alkaloids, at Various Stages of Growth, in 1911 and 1912.

Plant No.	Yield of alkaloids on which selection was based	Alkaloidal content (per cent.)											
		Stage of growth, 1911						Stage of growth, 1912					
		First	Second	Third	Fourth	Fifth	Average	First	Second	Third	Fourth	Fifth	Average
34	Low	0.335	.....	0.526	0.532	0.200	0.414	.....	0.292	0.320	.....	.....	0.406
3	Low	.384	0.375	.277	.549	.451	.407	.....	.393	.448	0.448	.....	.426
23	Low	.....	.348	.354	.487	.425	.403	0.496	.366	.341	.....	.....	.401
46	Low	.337	.285	.308	.588	.431	.390	.418	.334	.480	.483	0.314	.406
13	Medium	.614	.627	.626	.763	.563	.639	.495	.479	.655	.472	.488	.518
12	High	.649	.782	.693	.497	.584	.641	.767	.631	.685	.715	.394	.638
7w	High	.558	.831	.832	.727	.571	.704	.782	.666	.646	.694	.573	.672
6w	High	.596	.879	.925	.711	.722	.766	.847	.747	.882	.804	.558	.768

acteristics, not only on the average but at each picking. The recapitulation given in Table V shows this very clearly.

PROPAGATION OF THE FIRST GENERATION FROM SEED OF SELECTED INDIVIDUALS.

The seed from the individuals selected for exceptionally high and low production of alkaloids were planted in the greenhouse in the following January. After six weeks the young plants were transplanted to two-inch clay pots, and early in May they were set in the field. The seed had been secured during 1911, after the first season's test of the 59 plants had indicated which plants represented the desired type. During the first season these young plants made only sufficient growth to obtain two collective pickings from all the individual plants secured from each selected parent. There were from six to fifteen young plants from the seed of each individual selected. The first picking was secured in July, when the plants were in full bloom, and the second late in August, when the berries were partially ripe. In Table VI the results are summarized.

TABLE VI.

Alkaloids in the Leaves of First-generation Belladonna Plants Grown from Seed from Selected Parents.

Parent plant		Alkaloidal content (per cent.)			Parent plant		Alkaloidal content (per cent.)		
No.	Yield of alkaloids	First picking	Second picking	Average	No.	Yield of alkaloids	First picking	Second picking	Average
34.......	Low.....	0.524	0.693	0.609	12.......	High....	0.650	0.882	0.766
3........	Low.....	.479	.518	.498	7w......	High....	.617	1.063	.840
13.......	Medium.	.640	.859	.750	6w......	High....	.805	1.282	1.043

It will be seen that the alkaloidal content of the leaves during this first year indicate that the first-generation plants display the alkaloid-producing characteristic of the parents. Special attention is directed to plants 7w and 6w, the leaves of which contained over 1 per cent. of alkaloids during the second stage. The parents of these plants showed similar superiority over the remainder of the 59 plants originally examined, and there appeared to be no question about the first generation being equally valuable in this respect.

The following year, 1913, these same plants were picked four times: before flowering, when in full bloom, when the berries were developing, and, finally, when the berries were ripe and much new growth had appeared. The plants were large enough to furnish a sample from each individual. Table VII gives the results from each picking.

TABLE VII.

Alkaloids in the Leaves of Individual First-generation Belladonna Plants at Various Stages of Growth During the Second Season, 1913.

Plant No.	Alkaloidal content (per cent.)					Plant No.	Alkaloidal content (per cent.)				
	First stage, May 5	Second stage, May 23	Third stage, June 21	Fourth stage, Sept. 8	Average for season		First stage, May 5	Second stage, May 23	Third stage, June 21	Fourth stage, Sept. 8	Average for season
34_1	.....	0.316	0.324	.....	0.320	12_6	0.809	0.601	0.625	0.716	0.688
34_2	0.516	.473	.312	0.856	.539	12_7	.750	.608	.582	.574	.529
34_3	.608	.....	.352	.863	.604	12_8	.587	.434	.569	.653	.561
34_4	.754	.434	.288	.....	.492	12_9	.....	.....	.389	.549	.469
34_5	.622	.542	.356	.683	.551						
						$7W_1$	.....	.....	.626	.737	.681
3_1	.538	.366	.430	.523	.466	$7W_2$	.835	.550	.507	.759	.663
3_2	.565	.565	.630	.....	.587	$7W_3$	.620	.563	.431	.782	.599
3_3	.511	.552	.364	.790	.554	$7W_4$	.792	.777	.588	.804	.740
3_4	.693	.607	.350	.833	.621	$7W_5$	.....	.521	.699	.998	.739
3_5	.513	.477	.533	.767	.573	$7W_6$	.674	.721	.567	.663	.656
3_6	.438	.....	.392	.....	.415	$7W_7$	.369	.765	.760	.....	.631
3_7	.412	.415	.504	.....	.444	$7W_8$	.....	.291	.....	.645	.468
3_8	.....	.300	.....	.....	.300	$7W_9$	.714	.389	.544	.....	.412
3_9	.....	.479	.702	.782	.654	$7W_{10}$	.634	.496	.489	.764	.596
						$7W_{11}$	.....	.404	.626	.773	.601
13_1	.....	.255	.459	.934	.549						
13_2	.....	.365	.596	.....	.481	$6W_1$	.541	.543	.501	.666	.561
13_3	.....	.....	.453	.....	.453	$6W_2$	.....	.693	.881	.....	.787
13_4	.492	.359	.318	.649	.455	$6W_3$	.850	.641	.787	.885	.791
13_5	.....	.466	.559	.563	.529	$6W_4$	.866	.516	.529	.856	.692
13_6	.....	.....	.470	.733	.601	$6W_5$	.806	.640	.768	.829	.761
13_7	.....	.341	.552	.766	.553	$6W_6$	.780	.735	.663	.733	.728
13_8	.....	.349	.664	.792	.601	$6W_7$	.739	.917	1.313	.956	.981
13_9	.566	.452	.385	.815	.555	$6W_8$	.780	.921	.937	1.020	.915
						$6W_9$	.833	.921	.901	.919	.894
12_1	.854	.653	.737	.494	.688	$6W_{10}$	.908	.925	.927	.876	.909
12_2	.480	.516	.661	.717	.594	$6W_{11}$	.956	.973	.993	.924	.962
12_3	.760	.672	.675	.638	.686	$6W_{12}$	.681	.574	.670	.922	.712
12_4	.605	.572	.626	.....	.619	$6W_{13}$	1.143	.639	.852	.754	.847
12_5	.588	.....	.675	.908	.543						

In order to present the results more clearly the averages of the individuals from each parent are summarized in Table VIII.

TABLE VIII.

Summary of All Individual Plants from Each Parent.

Parent plant		Average alkaloidal content of leaves (per cent.)				
No.	Yield of alkaloids	Stage of growth				Average for season
		First stage	Second stage	Third stage	Fourth stage	
34	Low	0.625	0.441	0.326	0.800	0.501
3	Low	.524	.470	.488	.739	.512
13	Medium	.529	.369	.495	.765	.531
12	High	.679	.573	.617	.662	.597
7w	High	.662	.547	.583	.769	.617
6w	High	.824	.740	.824	.862	.811
Average	....	.640	.523	.555	.766	....

A study of these tables must lead to the conclusion that the first-generation plants have displayed in no small degree the parent characteristic as regards alkaloid production. While from an economic standpoint there is no interest in the low alkaloid-producing plants, they were kept under observation to serve as a means of comparison with the opposite type and to determine whether a low alkaloid production is also an inherent and transmissible characteristic.

STUDIES IN POLLINATION.

Thus far the propagation had been made entirely from seed from cross-pollinated parents. Much experimenting was done in trying to secure close-pollinated seed, with only partial success. The flower of the belladonna plant is so arranged as to make it highly receptive to cross-pollination to such insects as moths, bees, and, especially, bumble-bees. It is questionable whether any appreciable number of flowers become self-pollinated under ordinary conditions. The usual method of bagging was employed the first season, but was a complete failure. The flowers fail to pollinate with their own pollen, the arrangement of anther and stigma reducing the possibility of this to a minimum. As a rule, the flowers withered and dropped off. A further difficulty was experienced in the appearance of aphis in the bags in such numbers as to destroy completely the flower heads enclosed.

The second season the selected plants were screened in by building around them cheese-cloth frames. This method resulted in the pollinating of a few flowers on each plant, but the same difficulty existed. Aphis bred under the shelter in tremendous numbers, and in some cases fumigation with tobacco was necessary. However, sufficient seed was secured to make possible a comparative study of cross- and close-pollination with respect to alkaloid production.

The seed was secured from the original 59 plants. Since some of the selected individuals had died, the test was made with plants 6w and 7w, both selected for high alkaloid-producing tendencies. The seed was sown in the greenhouse and the young plants transplanted to the field in May. Two pickings were secured from all the individuals from each parent from both the cross- and the close-pollinated seed. The first nine samples were picked on August 19, when the plants were flowering, and the second on September 23, when the berries were in various stages of ripeness.

For the sake of brevity, the percentage of alkaloids in the leaves of all the individuals will not be recorded here, but Table IX gives the averages of all individuals from each lot.

TABLE IX.

Average Percentage of Alkaloids in the Leaves of First-generation Belladonna Plants from Seed of Close-pollinated and Cross-pollinated Selected Parents at Two Stages of Growth in 1913.

Lot		Alkaloidal yield of parent	Average alkaloidal content (per cent.)		
No.	Total number of individuals		First stage	Second stage	Season
Lot 6w close-pollinated.....	37	High	0.672	0.701	0.686
Lot 6w cross-pollinated.....	23	High	.586	.602	.594
Lot 7w close-pollinated.....	26	High	.595	.632	.614
Lot 7w cross-pollinated.....	24	High	.618	.611	.615

The following year, 1914, two pickings were again made, and the results for that year are summarized in Table X.

It would appear, from the tables, that the effect of close-pollination as compared with cross-pollination is not so great as would be expected. In the case of 6w the plants from close-pollination are, on the average, 0.092 per cent. richer than those from cross-pollination in 1913, and 0.042 per cent. richer in 1914. The 7w plants show a difference of 0.001 per cent. in favor of the cross-pollination in 1913 and a difference of 0.062 per cent. in favor of close-pollination in 1914.

TABLE X.

Average Percentage of Alkaloids in the Leaves of First-generation Belladonna Plants from Seed of Close-pollinated and Cross-pollinated Selected Parents at Two Stages of Growth in 1914.

Lot		Alkaloidal yield of parent	Average alkaloidal content (per cent.)		
No.	Total number of individuals		First stage	Second stage	Season
Lot 6w close-pollinated.....	34	High	0.906	0.765	0.835
Lot 6w cross-pollinated.....	19	High	.952	.634	.793
Lot 7w close-pollinated.....	24	High	.855	.753	.804
Lot 7w cross-pollinated.....	27	High	.865	.619	.742

If the results of the above experiment indicate the true value of close-pollination as compared with cross-pollination, the labor and expense necessary to insure close-pollination would seem to make that method of doubtful value. The explanation for the unexpected lack of influence of the close-pollination is not at present apparent.

SECOND-GENERATION PLANTS.

Up to this point the investigation had established the fact that alkaloid production is an inherent characteristic of the plant and can be transmitted to the next generation through seed. It still remained to be found, however, whether such a characteristic could be transmitted to the second and further generations.

For this purpose seed was secured in 1913 from the following first-generation plants: 3_1, 3_6, 3_7, 34_2, 34_3, 34_4, 34_5, 2_2, 2_3, $6w_7$, $6w_{10}$, $6w_{11}$, and $7w_5$. The plants from 3 and 34 were selected as types of low alkaloid-yielding plants, those from 2 as medium, and those from 6w and 7w as types of high alkaloid-yielding types. The seed was planted in the greenhouse at Arlington, Va., in January, 1914, and in May the young seedlings were divided into three lots. One lot was transplanted to the field at Arlington, Va., another was shipped to Timmonsville, S. C., for field transplanting, and the third to Madison, Wis. At Arlington and Madison two pickings were secured, while at Timmonsville only one was secured. Following is the number of individual plants in each lot planted at each of the three locations: $6w_7$, 15; $6w_{10}$, 15; $6w_{11}$, 18; $7w_5$, 4; 2_2, 8; 2_3, 17;

TABLE XI.

Alkaloids in the Leaves of Second-generation Belladonna Plants from Cross-pollinated Parents at Arlington, Va., Madison, Wis., and Timmonsville, S. C., in 1914.

Lot	Production of alkaloids in parent	Alkaloids (per cent.)												
		Arlington, Va.						Madison, Wis.						Timmons-ville, S.C.
		First stage			Second stage			First stage			Second stage			
		Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Average
6W$_7$	High	0.783	0.414	0.656	0.851	0.340	0.600	1.322	0.478	0.788	1.027	0.461	0.777	0.992
6W$_{10}$	High	.755	.327	.611	.691	.398	.543	1.062	.554	.800	1.115	.557	.829	.906
6W$_{11}$	High	.840	.359	.608	.775	.318	.524	.959	.554	.729	.988	.488	.745	.849
7W$_5$	High	.659	.543	.602	.653	.541	.584	.....	.....	.524	.....	.....	.532	.950
2$_2$	Medium	.557	.310	.429	.513	.295	.407	1.170	.580	.822	1.221	.605	.840	.....
2$_3$	Medium	.573	.418	.483	.646	.318	.471	.870	.455	.674	1.309	.366	.814	.771
3$_1$	Low	.532	.197	.496	.510	.263	.386	.541	.312	.524	.852	.423	.627	.702
3$_6$	Low	.....	.....	.....	.....	.....	.....	.....	.....	.474	.682	.424	.536	.532
3$_7$	Low	.502	.412	.446	.636	.318	.421	.717	.488	.602	.978	.630	.722	.669
34$_2$	Low	.720	.369	.538	.626	.254	.384	.940	.302	.673	.876	.439	.661	.801
34$_3$	Low	.659	.626	.645	.589	.501	.554	.596	.532	.571	.876	.765	.821	.852
34$_4$	Low	.641	.398	.496	.593	.142	.414	.471	.346	.530	.756	.478	.660	.663
34$_5$	Low	.674	.263	.479	.532	.308	.421	.583	.398	.514	.956	.318	.569	.705

3_1, 8; 3_6, 3; 3_7, 10; 34_2, 18; 34_3, 6; 34_4, 13; 34_5, 15. Some of these plants died in transit and in the field, but the number under investigation at Arlington and Madison was approximately that given in the list. At Timmonsville the plants were not picked individually, but one sample was secured from each lot. In Table XI the results of the analyses of these samples are summarized.

In order to show more clearly the rank of the several lots at the different locations, the averages are summarized in Table XII.

Table XII.

Averages of all the Plants from Each Parent at all Stages and at all Three Locations.

Parent	Plants included	Nature of alkaloid production	Percentage of alkaloids in leaves		
			Arlington, Va.	Madison, Wis.	Timmonsville, S. C.
6w......	All individual plants of lots $6w_7$, $6w_{10}$, and $6w_{11}$	High	0.592	0.778	0.916
7w......	All individual plants of lot $7w_5$	High	0.593	0.528	0.950
2........	All individual plants of lots 2_2, 2_3	Medium	0.446	0.788	0.771
34.......	All individual plants of lots 34_2, 34_3, 34_4, and 34_5	Low	0.491	0.642	0.755
3........	All individual plants of lots 3_1, 3_6, and 3_7	Low	0.437	0.581	0.634

A study of the averages leads to the conclusion that even at the three widely-separated localities these second-generation plants arrange themselves largely in the same order as the original selected parents. There are some exceptions, it is true. Thus at Madison, Wis., the averages show the plants of 7w to have been much weaker than the medium and low types 2, 34, and 3. However, only two individual plants of this lot lived, and hence the averages in that case are not a safe indication. This is the only notable exception to be found.

When it is considered that we have here plants two generations removed from the selected stock and propagated from cross-pollinated seed, the fact that their alkaloid-producing tendencies still show distinctly the character of the parent must be considered as fairly conclusive evidence of what can be accomplished. When it is further remembered that this last generation was grown in widely-separated localities the extent to which this metabolistic character is transmitted becomes still more evident.

Relation of Soil and Climate to Alkaloid Production.

The growing of belladonna plants from selected seed at the three localities mentioned offered exceptional opportunities to study the influence of soil and climate on alkaloid formation in the plants. This question is far from settled. As has already been mentioned, Gerrard, Chevalier, and Ransom and Henderson have studied the influence of various fertilizers on belladonna, but their conclusions are not entirely in accord. The writer has conducted fertilizer tests for several years, but the results failed to warrant any definite conclusions. Furthermore, such experiments, in view of the great variations found to exist in the alkaloidal content of belladonna plants, are likely to lead to questionable conclusions.

From the rather limited data secured with the second-generation plants one would be led to conclude that at Timmonsville, S. C., the plants find conditions conducive to high alkaloid production. However, since only one picking was secured during the season, such a conclusion is open to question. The soil at Madison, Wis., and at Arlington, Va., is a heavy clay, while at Timmonsville it is very sandy.

What are claimed to be equally important factors are sunshine and rainfall. Carr [10] claims that a maximum of sunshine and minimum of rainfall produces the greatest quantity of alkaloids. According to the records of the Weather Bureau, the total rainfall during May, June, July, and August, 1914, at Arlington, Va., Madison, Wis., and Florence, S. C. (7 miles from Timmonsville), was 16.24, 14.52, and 13.08 inches, respectively. The total number of clear days was 43, 41, and 46 respectively. According to the conclusions of Carr, the conditions at South Carolina should favor the production of the greatest percentage of alkaloids, since it had the least rainfall and the greatest number of clear days, which, of course, means sunshine. It can hardly be concluded, however, that this condition is responsible for the higher averages found at Timmonsville, because the difference in rainfall and clear days is entirely too slight. The writer is inclined to think, however, that an exceptionally dry and hot season will stimulate alkaloidal production. It is true, of course, that in such a season a minimum amount of growth is made by the plant, and it is not improbable that the actual production of alkaloids is normal to the plant and that the total weight is so much smaller that on analysis a greater concentration of alkaloids is indicated. This may also account for the seemingly greater percentage of alkaloids in the leaves in late summer, when the plant has the minimum foliage. Later in the season, when new fall growth appears, the percentage of alkaloids, as a rule, is nearer the average. It is not impossible that it is simply a translocation of constituents, or a crowding, as it were, of such constituents into less space.

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[10] Carr, F. H., *Op. cit.*

VEGETABLE PROPAGATION.

The question of propagating the desirable types of belladonna plants by vegetative means has also received some consideration. Good cuttings made in fall will take root fairly well in the greenhouse, but careful attention to moisture and temperature is absolutely necessary. By spring such cuttings have made a substantial root growth and can be transplanted to the field with very little loss.

Cuttings were secured from the first-generation plants in the fall of 1913. In 1914 two samples of leaves were secured from the individuals of each lot, which ranged from one to eight in number. For the sake of brevity, the percentage of alkaloids found in each individual will not be given, but in Table XIII the averages are presented.

TABLE XIII.

Summary of Seasonal and Group Averages of Plants Propagated from Selected Parents.

Lot	Alkaloid yield of parent	Average alkaloidal content (per cent.)	
		For season	For all plants from same parent
Lot $6w_{1}$..........	High.......	0.532	0.616
Lot $6w_{2}$..........	High.......	.517	
Lot $6w_{3}$..........	High.......	.634	
Lot $6w_{4}$..........	High.......	.565	
Lot $6w_{8}$..........	High.......	.772	
Lot $6w_{9}$.........	High.......	.643	
Lot $6w_{10}$.........	High.......	.648	
Lot $6w_{11}$.........	High.......	.649	
Lot $6w_{12}$.........	High.......	.581	
Lot $7w_{3}$..........	High.......	.544	0.610
Lot $7w_{4}$..........	High.......	.575	
Lot $7w_{5}$..........	High.......	.677	
Lot $7w_{10}$.........	High.......	.646	
Lot 34_{2}..........	Low.......	.537	0.529
Lot 34_{3}..........	Low.......	.588	
Lot 34_{5}..........	Low.......	.463	

As was to be expected, the cuttings show distinctly the same character as regards alkaloid production as the plants from which they were obtained.

While vegetative means can be employed in propagating desirable types, it is questionable whether the practice is practical as compared with propagation through seed. The cuttings on a commercial scale would require a great deal of space in winter and constant attention, while the seed can be sown in cold frames without attention. Furthermore, from the writer's observation, the cuttings, when set out in the field in spring, although hardy, make comparatively small leaf growth during the season as compared with seedlings. This would, of course, be a distinct disadvantage where tonnage per acre is considered.

ROOTS.

In this investigation the percentage of alkaloids in the leaves has been used in all cases. It would be of equal interest to study the alkaloids in the roots. The question of variation in the percentage in the roots is as unexplored as was that relating to the leaves when this investigation was undertaken. It would be interesting to know the extent to which high percentage in the leaves is paralleled, if at all, by a similar condition in the roots; also, whether the progeny, either from seed or cuttings, came true to type if the selection were based on the character of the root.

GENERAL CONSIDERATIONS.

In presenting the results of this investigation the writer has intended to bring to the notice of pharmacists, pharmaceutical manufacturers, and prospective growers of medicinal plants a subject which should be of interest at a time when the improvement of our drug plants is imperative and when such improvements can be undertaken under the best economic conditions. As has been stated, such work can be successfully undertaken only by special growers who have special training or employ specialists and who have the requisite laboratory facilities. There are no special difficulties connected with the problem. It is no difficult matter for the grower to stake out numerous individual plants in his field, make several analyses of their leaves during the season, and preserve the seed from desirable individuals. The following year this seed will give him a small plot of selected plants, which should preferably be some distance away from the general field. While all the individuals in such a plot will not be high in akaloids, the great majority are likely to be, and the collective seed from such a plot should yield, the following season, a field of belladonna of superior quality. While, in this investigation, the strain has been maintained through two generations, it will doubtless become weaker through further generations. It would be advisable, no doubt, to make new selections at least every other year in order to keep the quality of the crop from deteriorating.

Belladonna is by no means the only medicinal plant to be considered. It was selected for this work because it was especially suited for such a study, but the Office of Drug-Plant Investigations has already under way similar studies on hyoscyamus and digitalis. In the case of the former, certain cultural difficulties must be overcome first, while digitalis presents a somewhat more difficult problem, in that its active constituents are not as readily nor as accurately measured. However, if it is found that the improvement of belladonna can be successfully undertaken by scientifically-trained drug growers, it should be sufficient encouragement to apply similar methods to a much wider field until the cultivation of medicinal plants in this country is placed on such a basis as to furnish not only quantity but high quality of drugs for domestic use.

NOTE ON TESTING CALCIUM COMPOUNDS.

By Carl E. Smith.

This is written to draw attention to a deficiency in the tests of the United States Pharmacopœia for the identification of calcium compounds and for the detection of certain possible contaminations, such as might easily lead to serious results because of the false sense of security the official tests would give. As an example it might be mentioned that a specimen of strontium carbonate containing several per cent. of barium carbonate will stand all the tests given in the U.S.P. for establishing the identity and purity of precipitated calcium carbonate.

A sample of powder was recently submitted to the writer for analysis, which, because of a statement accompanying it concerning its uses, was supposed to consist, in greater part at least, of calcium salts. Preliminary tests proved presence of alkaline earth carbonate in large quantity. This led to the tentative conclusion that the powder probably consisted chiefly of calcium carbonate, as there was no reason to suspect presence of barium or strontium salts. Absence of color and complete solubility in dilute acids excluded the presence of elutriated native chalk. It was therefore expected that the U.S.P. tests laid down for precipitated chalk would definitely establish its identity as such and also detect in great probability any impurity or admixture. The sample stood all the tests and conformed also to the description of physical properties given. A little sodium chloride and traces of iron were found and as the U.S.P. lacks a test for magnesia, which is often found in calcium salts to some extent, a test was made in the usual way with phosphate, and a reaction was obtained that apparently indicated the presence of a small amount of that impurity. Dependence on the U.S.P. tests, therefore, would have led to the conclusion that the specimen in question not only was calcium carbonate, but a salt of such a degree of purity as to warrant its use in medicinal preparations. Further examination, however, showed that the sample was *not* calcium carbonate, that it contained neither calcium nor magnesium, but consisted of strontium carbonate contaminated with about 1.5 per cent. of barium carbonate.

The test upon which the Pharmacopœia relies entirely for the identification of calcium salts is the production of a precipitate on addition, to the neutral solution, of a solution of ammonium oxalate, said precipitate to be soluble in hydrochloric acid, but insoluble in acetic acid. But this reaction is by no means characteristic of calcium alone. It is shared by strontium and, to some extent, by barium, and neither of these latter is excluded or detected by any other test provided. It is true that calcium salts are not liable to contain either barium or strontium as natural impurities, nor are they liable to be introduced in the course of manufacture, but accidental substitution or admixture might readily take place and such contingencies should certainly be guarded against by suitable means.

Examination of the text of the U.S.P. pertaining to other calcium salts shows that in no case do the tests adequately differentiate calcium from other alkaline earth compounds. A test for the identification of a substance should be characteristic enough to distinguish it from everything else, beyond all reasonable doubt.

Of course, the remedy for the defects pointed out in this note is self-evident to every competent analyst. It need only be mentioned that a saturated water solution of calcium sulphate would seem to be the simplest means of detecting the presence of either barium or strontium.

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EXPERIMENTAL DEMONSTRATIONS OF ADHESION ALKALOIDAL REACTIONS.*

By John Uri Lloyd, Ph.M.

The speaker was introduced by Professor J. P. Remington, who happily referred to Mr. Lloyd's lifetime devoted to such studies as were to be the feature of the present meeting. His remarks, in recognition of the research accomplishments of their guest, were highly complimentary. Indeed, he added, his long established contributions had led the Philadelphia College of Pharmacy, as early as 1890, to confer upon him the degree of Ph.M. "Therefore," said Professor Remington, "we to-day welcome one of our own members to his Philadelphia home, and shall listen with interest to the message he brings to us in this exhibition phase of one of the features of a life-work devoted to patient pharmaceutical research."

Professor Lloyd prefaced his remarks by asking that the experimental phenomena presented be accepted as established facts, but that his cautiously offered explanations therefor be considered as opinions merely based on his present knowledge. He claimed the privilege of revising his views of the reactions in accordance with evidence presented hereafter by either other investigators or himself. "This is a nearly untrodden field," he said, "and needs now be cautiously touched, theoretically."

Continuing, Professor Lloyd said, "I consider the process to be that of *adhesion,* but if this be true, a phase of the reaction with the alkaloids of sanguinaria is exceedingly puzzling, as indicated in my paper presented to the recent meeting of the American Pharmaceutical Association, San Francisco. *'Adhesion'* is, however, the best term now in view, and receives the support of such eminent scientists as Ostwald and Gordin."

The alkaloidal reagent employed by Professor Lloyd is a highly hydrated condition of aluminum silicate, in exceeding colloidal form. He explained the process of its production from plastic clay or fuller's earth, and ventured to predict that it might yet be demonstrated that to the *water* side of the compound might be attributed its attractive energy. "Almost I would venture to coin for the most potent form of this reagent the term 'Colloidal Water,'" he said. Then he added, "At least, the alkaloidal affinity depends on the influence of the water present, because *anhydrous* aluminum silicate has no alkaloidal attraction whatever."

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* Address delivered at a Pharmaceutical Meeting on March 24, 1916.

"The term *colloidal,*" he said, "is used after the general definition of Graham, but I might perhaps as well, or even better, employ the term *amorphous.* Indeed, in the series of pharmacy articles contributed to the American Pharmaceutical Association, 1879 to 1885, I used the terms, 'mass action,' 'structural affinity,' 'amorphous' and 'colloidal.' Possibly I can no better now, than then, differentiate between these terms.

"The reagent is without crystalline form, and so are the alkaloids I have thus far abstracted by it, with one exception. This alkaloid I call the '*Second Alkaloid of Veratrum.*' And yet, under certain artificial strains, crystals can be produced from the amorphous forms of some of the others." This point was later illustrated on the screen.

These prefatory remarks, the speaker stated, were designed to enable him to introduce, as intelligently as possible, the experiments to follow, and he added that he again claimed the privilege of revising his present views concerning any theoretical phase of the problem.

He then dissolved bisulphate of quinine in a large cylinder of water, made the solution acid with sulphuric acid, and next divided it into two portions. To one he added a small amount of his reagent, and having shaken it well, filtered it into a cylinder, which he placed beside the reserved half. The original was deeply fluorescent, the filtered part devoid of fluorescence. Then to each he added Mayer's test solution for alkaloids. An abundant precipitate occurred in the original. The filtrate from the portion acted upon by the reagent remained transparent.

He now mixed a portion of high-grade alkaloidal, powdered cinchona bark, with dilute sulphuric acid and filtered. To one-half of the filtrate he added a portion of his reagent and filtered it into a cylinder beside the reserved portion. Then to each he added Mayer's test reagent. The original gave a heavy white precipitate. None whatever occurred in the other.

Said he, "Nature has fortunately given us two alkaloids that yield colored salts, one yellow (berberine), the other red (sanguinarine)." He dissolved, separately, berberine sulphate and sanguinarine sulphate, dividing each liquid into two parts. To one part of each he added a portion of his reagent, filtering into a cylinder beside the reserved, *colored* half. *Both filtrates passed transparent, and as colorless as water.* These experiments were very striking.

"May I venture to ask the privilege of voicing my conclusions concerning certain phases of this phenomenon?" asked the speaker.

"This reagent is a colloidal form of hydrous aluminum silicate, and is insoluble in water. It is so nearly neutral as scarcely to affect either red or blue litmus paper. And yet, it has the power of grasping an alkaloid or its salt, or a natural texture of alkaloidal relationship in which an alkaloid resides, even though the alkaloidal part be in almost inappreciable amount. Seemingly, the colloidal sponge sucks bodily the alkaloid or alkaloid-bearing texture into itself. *This, in the presence of an acid,* the usual solvent of alkaloids.

"I consider the water-saturated, colloidal reagent to be made up of a magma comprising groups of *Colloidal Sponges,* in varying conditions of hydration, in which, perhaps, the earthy particles are mere microscopic points that are held apart by water zones and surface films. Perhaps the entire corpuscle is an adhesion compound in which earth and water are blended into a complex whole. The energy of the compound depends on the *colloidal condition* of the structure, and is governed by the condition and proportions of the water of adhesion. The addition of the alkaloid to the reagent liberates this water and destroys the colloidal condition of the mother sponge, the product which, before, was a slime, settling as earth does in water.

"So tenaciously are the alkaloids held by this reagent that even strychnine is no longer bitter. And yet, the combination has been shown to be as active, physiologically, as the ordinary alkaloidal salts of strychnine. Other bitter alkaloids, such as berberine, are likewise tasteless, but some alkaloids leave a lingering after-taste of bitterness, due to the alkaline nature of the saliva, which, dissociating the compound, liberates traces of the alkaloid.

"This liberation of the alkaloid by an alkali may be advantageously utilized in alkaloidal manipulations. From a drug percolated with dilute acid, or even by water, the alkaloid may be separated by means of the reagent, and from this combination liberated by means of an alkali in the presence of a suitable solvent, such as chloroform or ether, from which it may be recovered, by usual processes."

Notwithstanding that the alkaloids thus obtained are amorphous or colloidal, they may, under artificial strain, assume crystalline conditions.

This was illustrated by a series of graphic slide presentations in which the reagent was first shown as colloidal globules which, when alkaloid saturated, still remained colloidal, but when in thin film, the alkaloid was liberated, it formed micro-crystals that, with the specimens illustrated (strychnine and cocaine), were very characteristic. As a final suggestion, attention was called to the fact that in their natural settings the alkaloidal textures of green drugs were colloidal, be they juice or tissue.

After the exhibition, a call was made on Professor Kraemer, whose accomplishments in botany and in plant histology eminently fitted him to make a balanced review of the lesson of the day. His comments were addressed mainly to the students of the College of Pharmacy present, and were of such a nature as to inspire them with their opportunities. Said he, " It can be seen that even a neglected earth may yield a substance that may open the door to a new study of plant structures. These beautiful experiments, and these attractive screen illustrations, are due, not to stumbling accidents, but are the result of a lifetime of persevering study, but for which the discovery would not have been made, and the phenomena presented would have been unnoticed." Professor Kraemer begged the audience to take the lesson as an inspiration. " Indeed," he added, " I am not so sure but that Professor Lloyd has brought to us this exhibition for the purpose of opening avenues of investigation, both practical and theoretical."

THE " NOBLE " GASES.

How the " Nitrogen " of a Generation Ago Has Been Made to Yield Six, and Possibly Seven, Elements and the Value of This Discovery to Chemistry.[1]

By Henry P. Talbot.

From the earliest days of quantitative chemical experimentation the atmosphere has been the subject of frequent investigation. The discovery of oxygen as a separate entity resulted from the independent researches of Priestley in England and Scheele in Sweden about 1774, and nitrogen had been recognized as a new gaseous substance by Rutherford in 1772. The part which these two gases play in the atmosphere was demonstrated a little later, and for more than a century the literature contains innumerable records of physical and chemical measurements based upon the assumption that these two elements constitute the sole essential constituents of the gaseous envelope of the earth. Other substances, such as moisture, ammonia, and carbon dioxide, are, to be sure, universally present, but are accidental components, varying in amount according to local conditions, while oxygen and nitrogen are to be found in approximately constant proportions, no matter where the specimens of air may be collected.

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[1] Reprinted from *Science Conspectus*, 1916, p. 16.

Such was the universal belief when, in 1893, Lord Rayleigh, an English physicist, undertook to review the measurements of some of the natural constants of the more common permanent gases, among them the density of nitrogen gas. He was profoundly astonished to discover that " nitrogen " obtained from the atmosphere after removal of the other constituents, according to the then accepted methods, was distinctly heavier, volume for volume, than nitrogen obtained from the decomposition of chemical compounds of which it is a component. The differences were much too large to be accounted for by errors in manipulation or observation, since these were accurate to about one part in ten thousand, while the discrepancies in weight were of the order of one part in two thousand.

When this announcement was made public, speculation as to the cause of the observed difference in density was rife, but it soon became highly probable that a search must be made for a new element in " atmospheric nitrogen," as the residual gas which remains after the removal of the other constituents from the atmosphere is now called. To this search Lord Rayleigh and Professor (now Sir William) Ramsay addressed themselves.

They first employed a method which was a repetition of work done nearly a century before by Cavendish. An electric discharge was passed through air in the presence of an alkali. This causes the oxygen to combine with a part of the nitrogen and the products of the combustion are absorbed by the alkali. In this way the oxygen can be removed, and the residue is " atmospheric nitrogen." Nitrogen is a comparatively inactive element in a chemical sense, but it can be made to combine directly with certain of the metals, such as magnesium, and by repeatedly passing the residual gas over the metal until no more diminution in volume occurred, they obtained a small quantity of a gas which was twenty times as heavy as hydrogen (taken as a standard), whereas nitrogen is only fourteen times as heavy. This final residual gas was found to amount to a little less than 1 per cent. by volume of the original air. These results were confirmed by other and different procedures, and in 1895 the two co-workers felt justified in announcing the discovery of a new element, to which they gave the name argon, the inert; a name which later investigation has justified, since argon has resisted all attempts of the most varied character to induce it to enter into chemical combination with any of the other elements.

It is interesting to note that Cavendish just missed the discovery of this element, for in the record of his experiments we find that, when sparking a mixture of nitrogen with an excess of oxygen, he obtained a residue, of which he says: "If there is any part of the phlogisticated air (now called nitrogen) of our atmosphere which differs from the rest and cannot be reduced to nitrous acid, we may safely conclude that it is not more than one-one hundred and twentieth of the whole." The residue was undoubtedly argon, and it is remarkable that this record should have passed unnoticed for more than a century.

The chemist conceives that any given element is not indefinitely subdivisible by chemical agencies. He terms the ultimate particles atoms and further conceives that compounds are formed by the union of atoms of different elements. It is not possible to determine with accuracy the absolute weights of these atoms in terms of any units of weight in common use, but it is possible to determine the relative weights of the atoms of different elements, in terms of the weight of the atom of hydrogen taken as a standard. When a new element is discovered, almost the first concern of the chemist is to fix a value for its atomic weight on this hydrogen scale. Although argon, as already stated, forms no chemical compounds, it was found possible from its physical constants to fix upon a value for its atomic weight with much probability of truth. But a fresh difficulty then presented itself; namely, that this new element did not fit into the so-called periodic system of the elements. Mendelejeff has found that, if the known elements are arranged in the order of their atomic weights, those elements which have generally similar properties recur periodically in the resulting system. But argon, with an atomic weight 40, which was the value found for it, would be out of place; that is, it would be associated in the system with very dissimilar elements. Since repeated determinations of the atomic weight made upon different specimens of the gas confirmed the figures first obtained, and since, according to the periodic system, the value seemed to be too large, a search was begun for possible small admixtures with the argon of a second new element with larger atomic weight.

At this time it was recalled that nitrogen had been found in the gases occluded in certain minerals, and it was suggested that argon might also be found in these gases. Professor Ramsay collected a considerable quantity of the gases from a mineral called cleveite, and these did contain argon, but they yielded also another new element, although not the one for which they were searching. In this discovery the spectroscope played the principal part. It is known that highly heated gases give out light which when examined with the aid of a prism is found to be different from sunlight, in that it does not produce a continuous spectrum. The heated gases emit light of certain definite wave-lengths, which appear as bright lines in different parts of the spectrum. These lines can be charted with great exactness and have a constant position for a given element. Sir William Crookes, who made the spectroscopic examination of the gases from cleveite, reported the presence of an element yielding lines identical with those shown in the spectrum of the sun's chromosphere during an eclipse, and ascribed as far back as 1868, by Lockyer, to an element which he called helium. Later measurements confirmed the identity of the lines in the spectrum of the new gas with those of helium, and density determinations showed that this element has an atomic weight of 4 on the scale indicated above. It could not, therefore, account for the discrepancy in the atomic weight of argon, but its discovery clearly pointed to the existence of other elements of the general character of argon. It should be noted in passing that the similarity of the spectra of argon and nitrogen, as well as its inert character, largely accounts for the failure to detect its presence in the atmosphere for so long a time.

Thus stimulated, the search for other inactive elements was continued. A considerable quantity of argon from the atmosphere had been laboriously collected, and preparations were made to liquefy it and subject the liquid to fractional distillation; that is, to allow it to evaporate slowly, collecting the gases evolved in separate portions or "fractions," the first of which would contain a larger proportion of that element which boiled away most readily, just as alcohol tends to boil away first from a mixture of alcohol and water in the radiator of an automobile. These "fractions" were then separately liquefied, and each, in turn, refractionated, in this way gradually separating the more volatile from the less volatile constituents. The same procedure was applied to the residues obtained upon the evaporation of liquid air. Indeed, without the use of liquid air and liquid hydrogen, as refrigerating agents, or the skill in manipulation of liquefied gases obtained through the handling of liquid air, together with the perfection of the evacuated double-walled Dewar flasks, the isolation of the different inert gases would not have been possible.

The separation by means of fractional distillation had to be supplemented by other physical methods, namely, atmolysis, or diffusion through minute openings; and later, the adsorption of gases in the pores of willow-charcoal at low temperatures. The less the density of a gas the more readily it diffuses, hence by passing a mixture of gases of different densities through something like the stem of a clay pipe, the lighter gas is made to pass through the pores at a more rapid rate than the others and may be collected from the outside.

By combinations of these three procedures, fractional distillation, diffusion, and selective adsorption in charcoal, it has been possible to isolate and identify five members of this wholly unique group of gases, often called the "noble gases" because of their apparent disinclination to associate themselves with other elements. The elements are helium, neon, argon, krypton, and xenon. The first two are lighter, the last two heavier, than argon. Notwithstanding the discovery of the two latter elements, the anomalous position of argon in the periodic system is still unexplained, since they are not present in sufficient amounts to alter appreciably the atomic weight determination. The other members fit into the periodic system without difficulty.

A sixth member has recently been added to the group in the discovery of niton, the emanation given off by radium compounds in the first step of their disintegration. This has been obtained in amounts weighable only by specially constructed balances of remarkable accuracy, but, notwithstanding the great difficulties to be overcome, its atomic weight has been determined with probable accuracy, and its chemical inertness established. There is some reason for suspecting the existence of a seventh "noble gas," lighter than helium, which, because of its small mass, would not probably remain in the earth's atmosphere but would be attracted by the larger heavenly bodies, and would even then probably be found only in the outer portions of their atmosphere. Spectral lines have been detected from the sun's corona, emitted by some substance outside the zone of hydrogen or helium, and these lines are not identical with those of any terrestrially known element. The name coronium has been tentatively assigned to this element—just as helium was named by Lockyer in 1868—and it may be another "noble" gas.

Five members of this group, helium, neon, argon, krypton, and xenon, are found in the atmosphere, and niton is probably present in most minute amounts. The proportions of the other gases seem to be about as follows:

Helium, 1 : 185,000; neon, 1 : 55,000; argon, 1 : 160.3; krypton, 1 : 20,000,000; xenon, 1 : 170,000,000.

Liquid air is the source of all of these gases to-day, except helium, which although present in liquid air is more readily obtained from the gases occluded in certain minerals, as noted already. Neon has offered the greatest difficulties in purification.

The discovery of a series of elements without any chemistry, such as had been unknown and possibly unimagined, was, of course, sufficient to excite great scientific interest, after a certain period of incredulity as to the validity of the discovery had passed. Their scientific importance is further enormously enhanced by the discovery that helium is a product of the disintegration of radioactive materials, and that all terrestrial helium probably owes its origin to this source. There is no direct evidence at present that any of the other inert gases, except niton, have a similar origin, but the final conclusion on this point has yet to be reached.

Helium remained unique for some time after its discovery as the only gas which it was impossible to liquefy. Even Dewar, so skilled in such methods, was unsuccessful, but Onnes, building upon the foundation laid by Dewar, has succeeded, and has produced liquid helium in considerable quantities. Its boiling-point is about 4° above absolute zero, that is, about $-269°$ C., and Professor Onnes has conducted a series of most valuable investigations upon the effect of this temperature (the lowest at our command) upon physical phenomena, notably electrical phenomena. One of the most striking results of his investigations is his demonstration that an electrical current induced in a lead ring placed in liquid helium continues to flow for a long time after the exciting cause is removed; that is, electrical resistance nearly disappears at that temperature. It is evident that this opens an immense field for experimentation and speculation.

Argon is now comparatively easily obtainable from liquid air, provided it is not necessary to purify it from the small amounts of the other inert gases, which do no harm in argon for technical purposes. It has already found commercial use in the "argon lamp," the successor of the nitrogen lamp. Formerly the bulbs of the tungsten lamps were evacuated as completely as possible, but it was subsequently found that if these lamps were filled with nitrogen at atmospheric pressure they could be run at a higher temperature and greater efficiency without too great evaporation of tungsten from the filaments. This is supposed to be due, in part, to the collision of the molecules of tungsten as they leave the surface of the filament with those of nitrogen gas, which drives many of them back to the filament. Since argon has a heavier molecule than nitrogen, and is completely inert, it has been substituted in these lamps, with a resulting further increase in efficiency.

Krypton, notwithstanding the minute proportions in the atmosphere, is possibly intimately connected with the phenomena of "northern lights," since the spectrum of these lights shows the lines of krypton with considerable prominence.

From a scientific viewpoint niton is the most unusual of these elements, since it possesses two characteristics which were absolutely unknown in 1895; namely, complete chemical inactivity, and a temporary existence due to atomic disintegration, the discovery of which has given rise to a new primary science, radioactivity. Niton has already been used, in aqueous solution, as a curative agent in radiotherapy. The nature of the changes involved could not be made clear without a somewhat extensive presentation of radioactive phenomena in general.

Although of comparatively little practical value in themselves, the discovery of these noble gases, closely associated as two of them are known to be with the story of radium and its congeners, has had an enormous influence upon our present concepts in physics and chemistry which is daily bearing fruit. What the future may bring is beyond the compass of our imaginations, but new ground has been broken, which has permitted us to delve a little deeper into the foundations of scientific knowledge. Old concepts have been confirmed and broadened (very few destroyed), while vast unsuspected stores of energy in common matter have been revealed, which only our ignorance of to-day prevents us from using for the purposes of life.

BOOK REVIEWS.

New and Non-official Remedies, 1916, Containing Descriptions of the Articles Which Have Been Accepted by the Council on Pharmacy and Chemistry of the American Medical Association Prior to January 1, 1916. This book, which makes its appearance annually, carefully revised and up-to-date, is beginning to assume almost voluminous proportions. Including the usual index and an index to distributers, it consists of 428 pages of information concerning newer remedies and the latest knowledge concerning the remedies that have been known to medical science for decades. For illustration, nearly twelve pages are devoted to "digitalis principles and preparations," and give, in a clear and succinct manner, all the information about the cardiac tonics that the busy practitioner should know. Under "Arsenic and Arsenic Compounds," much valuable information is given pertaining to the latest organic combinations of this important drug. Several pages are devoted to Ehrlich's Salvarsan and Neosalvarsan and information of a kind given that the pharmacist may be called upon to make use of at any time in serving his medical clientèle. Much information of a practical nature is given concerning serums and vaccines, diagnostic agents, antigens used for prophylactic or therapeutic purposes, radium and radium salts, and not the least valuable part of this book is the information as to where these things are obtainable; who manufactures and distributes; where a medicinal preparation is manufactured and how readily it can be obtained are many times matters of great importance to the busy physician and pharmacist. The so-called digestive ferments are also considered and the various organs of animals used in therapeutics are commented on. The Council, however, states that it assumes no responsibility for the quality or identity of preparations from the latter. Lactic-acid producing organisms and preparations are briefly reviewed and discussed from the viewpoint of common sense.

John K. Thum.

Digest of Comments on the Pharmacopœia of the United States of America and the National Formulary for the Calendar Year Ending December 31, 1914, by Martin I. Wilbert, Hygienic Laboratory Bulletin No. 105, February, 1916, Washington, Government Printing Office. The present volume, like those that have been published before it, contains much interesting matter in the way of brief references anent pharmacopœial literature. A list of the publications reviewed is given and is striking evidence of the painstaking efforts made to cover all of the available literature bearing on pharmacopœial revision. Of course, in a work of this kind the references must necessarily be of a brief nature, and this point is conceded by the author. Despite that fact, the information and suggestions one sees throughout the book prove its usefulness. That it has been of considerable benefit to those who are directly interested in the work of revising the U.S.P. and the N.F. must be apparent to all those who know what revision work means. A. Tschirch, in a paper published in 1913, tersely remarks that successful revision is dependent on a "complete and perfect review of the literature pertaining to pharmacy and materia medica." And he goes on to say that "the practical Americans have long been aware of this part of pharmacopœial revision and have taken means to overcome it" by governmental publication of references to articles bearing on this important work. While Tschirch's paper deals altogether with the subject of establishing an international pharmacopœial bureau, his remark that abstracting activity should be supplemented with the findings from a central laboratory will, no doubt, appeal to many as being applicable to furthering and broadening the activity of the "Digest."

Including the index, this volume consists of nearly 509 pages. Abstracts referring to articles on foreign pharmacopœias and international standards are also given and should prove of much practical value.

JOHN K. THUM.

PHILADELPHIA COLLEGE OF PHARMACY.

ANNUAL MEETING.

The annual meeting of the Philadelphia College of Pharmacy was held March 27, 1916, at 4 P.M., in the Library, the President, Howard B. French, presiding. Nineteen members were present. The minutes of the quarterly meeting, held December 27, 1915, were read and approved. The minutes of the Board of Trustees for December, 1915, January and February, 1916, were read by the Registrar, J. S. Beetem, and approved.

President French then delivered his annual address, at the conclusion of which considerable applause was given, when, on motion, duly seconded, the address was referred to the Committee of Publication with leave to abstract.

REPORT OF COMMITTEE OF PUBLICATION.—In the absence of the chairman, Professor Sadtler, the report was read by Professor Remington. " THE AMERICAN JOURNAL OF PHARMACY has been published regularly during the past twelve months. The financial statement herewith presented covers the period from March 17, 1915, to March 15, 1916. All bills having been paid, the financial report is very gratifying to the Committee in that it shows a balance which is twice that of last year. The receipts from subscriptions and sale of back numbers exceed all previous records. The question of supplying back numbers is giving us much concern, and if our members would keep on the lookout for back numbers, especially the earlier volumes, it would help us very much. The Committee record their appreciation of the interest of the Massachusetts College of Pharmacy and our fellow-members, Mr. Beringer and Mr. Beetem, in sending a supply of back numbers. The usual annual appropriation from the College to pay for cost of copies to members and exchanges was made."

REPORT OF THE EDITOR.—Professor Henry Kraemer said:

" Such things as the Atlantic Monthly," wrote Charles Eliot Norton to James Russell Lowell in 1857, " are never permanent in our country. They burn brightly for a little while and then burn out and some other light takes their place. It would be a great thing for us if any undertaking of this kind could live long enough to get affections and associations connected with it whose steady glow should take the place and more than supply the shine of novelty and the dazzle of a first go-off." Fortunately there has been a culture and a scholarship developed in this country to support the Atlantic Monthly, and this magazine of three generations is one of the proudest possessions of the American people. If we revert back to the beginnings of our JOURNAL in 1825, it will be apparent that the College was not only ambitious, but that the members had a faith greater than that of Norton when the Atlantic Monthly was founded. The first four numbers were published on December, 1825, May, 1826, September, 1827, and November, 1827. In these numbers we find special papers by Daniel B. Smith, Samuel Jackson, R. A. Hare, and others. These numbers were published by the Publishing Committee, consisting of Samuel Jackson, M.D., Henry Troth, Solomon Temple, Ellis H. Yarnall, and Daniel B. Smith.

In 1829, largely due to the efforts of Dr. Benjamin Ellis, the JOURNAL was launched with a definite policy and the regular volumes were begun. He was assisted by the Publishing Committee, consisting of Daniel B. Smith, Charles Ellis, S. P. Griffitts, Jr., and Dr. George B. Wood. Dr. Ellis unfortunately died at the early age of 34 years and was succeeded by Dr. Robert Egglesfield

Griffith, who was compelled, by reason of ill-health, to resign his professorship and give up his work on the Journal in 1838. Both Ellis and Griffith have not only left their imprint on the pages of the Journal, but in their Formularies have contributed much to the progress of pharmacy.

The third editor of the Journal was Dr. Joseph Carson, whose editorship ran from 1838–1848. Dr. Carson was one of the ablest men ever connected with our College, his books and his orginal papers being of a very high order. Dr. Carson was succeeded by Professor William Procter, Jr., who held the position for twenty-two years. During his time the numbers issued per year were extended from four to six. Professor Procter was one of the most voluminous contributors, and his name will be revered for many generations to come. Professor Procter was succeeded by Professor John M. Maisch, who held the office from 1871 to 1893, a period of twenty-two years, equal to that of Procter. Professor Maisch was likewise a large contributor and during his time the numbers issued annually were increased to twelve. In 1894, Professor Trimble was elected editor, which position he occupied until 1898, when he died. His untimely death was a great blow to our College, as his enthusiasm and unselfishness were of intrinsic value in adding to the prestige of the Journal. During this time he and Professor Bastin made most valuable contributions to the Journal, these articles even to-day being specially called for. Since 1898, the writer has assumed the duties of editor, a period of eighteen years. *Tempus fugit!* How time flies! As one is going over the material for each issue, he hardly realizes how the work accumulates as the years roll on. By actual measurement, there is a yard-stick of bound volumes which have been added during these eighteen years. Prompted by this thought, I find that there are four yards of volumes contributed during these ninety years. Nearly five generations of workers have labored incessantly to keep burning the lamp of knowledge enkindled by the first Publishing Committee. At no time, probably, has there been more enthusiasm and greater stimulus for the development of the Journal than to-day. As the Atlantic Monthly is the pride of American men of letters, so the American Journal of Pharmacy is the pride of American pharmacists. Our policy has not been to force the ideals of the leaders upon the profession but rather that the pages be like the lamps in our cathedrals, calling attention to the ideals for which we should strive. There has been one purpose, one character, which dominates the pages from the beginning. This has always been of a very high quality and has rung true to the highest ethics. There is no professional journal with such a record, and few scientific journals have such a history.

The past year has been one of great satisfaction to the editor in that there has been a sustained interest among our subscribers and advertisers, and there have been many words of encouragement received. Without desiring to detract from the work of other members, I desire to express my appreciation to our fellow-members, Mr. John K. Thum and Sister Bertha Muller, for their abstracts from foreign sources and their assistance in the columns of Current Literature. I cannot let this opportunity pass without saying a word of grateful recognition of Professor Samuel P. Sadtler, who has been a member of the Publication Committee since 1895, and its chairman during most of these years. His counsel and his sympathy have done much to keep alive the enthusiasm and ambition of the present editor. His name is so linked with that of the JOURNAL that we trust that, no matter what other positions he may relinquish in the College work, he will continue as a member of the Publication Committee.

On motion, the report was ordered entered and filed.

COMMITTEE ON PHARMACEUTICAL MEETINGS.—The report was read by Professor Kraemer: "During the past year but a single meeting has been held, but what was lacking in numbers has been more than offset by quality. Professor John Uri Lloyd, of Cincinnati, gave us a lecture on "Natural Alkaloidal Structures," which was illustrated by experiments and lantern slides. Quite a few of the members of the College and nearly all of the students who could possibly attend were present. In some respects it was an historic lecture. Professor Lloyd has been a profound investigator in pharmacy for about forty years. His papers have been almost overlooked, and yet they touch so deep that even now Wolfgang Ostwald is having them translated for publication in the "Zeitschrift für Chemie und Industrie der Kolloide." When, on motion, the report was ordered entered and filed.

REPORT OF THE CURATOR.—Read by Mr. Joseph W. England: "The collections of drugs in the Museum of the College embrace many rare and valuable specimens and form probably one of the most valuable in the country. The specimens are derived from animal, vegetable and chemical sources, and have been arranged according to origin. To Professor Kraemer belongs the credit of suggesting that the collections be entirely rearranged along chiefly educational and historical lines, so that they shall be of some popular interest, and under his direction this has been done. The rearranged collections have been labelled through the generosity of our fellow-member, Mr. George B. Evans, whose son has also taken a very deep interest in the work. Special donations have been made illustrating the processes in the manufacture of sugar, which have been sent in by the Franklin Sugar Refining Company. Another collection of much interest is the chemical products obtained from licorice, which have been donated by the McAndrew Forbes Company. A number of monographic collections have also been installed, which are illustrated with large drawings and photographs belonging to Professor Henry Kraemer, who has loaned them to the College. The portraits have been rearranged and displayed to greater advantage." The report was ordered entered and filed.

THE REPORT OF THE LIBRARIAN, Miss Katherine E. Nagle, was read by Joseph W. England.

"The total number of books accessioned to this date is 8899, and up to this time 3195 books have been catalogued. During the past year the use of the Library by the professors and students has materially increased, and it will increase in greater ratio when the catalogue is in condition to be consulted. The number of volumes in the Library is about 14,000, besides several thousand pamphlets. Use of the Library for the year as follows: professors, 189 times; students, 2700 times; public, 101 times.

The report was ordered entered and filed.

ELECTION OF OFFICERS AND TRUSTEES AND COMMITTEES.—After the Report of the Committee on Nominations was read, Messrs. Boring and Bernstein were appointed tellers.

Before the ballot was taken, Mr. Warren H. Poley tendered his resignation as a member of the Board of Trustees, he having been nominated for treasurer in place of Richard M. Shoemaker, who declined a renomination. The resignation was accepted and a ballot taken; while the tellers were counting the vote the president made the following appointments:

Committee on By-laws: George M. Beringer, Joseph W. England, C. A. Weidemann.

Delegates to the Pennsylvania Pharmaceutical Association: C. B. Lowe, F. X. Moerk, F. P. Stroup, Charles H. LaWall, E. F. Cook, O. W. Osterlund.

Delegates to the New Jersey Pharmaceutical Association: Joseph P. Remington, George M. Beringer, Charles H. LaWall, H. P. Thorn, John W. Hayes.

Delegates to the Delaware Pharmaceutical Association: A. W. Miller, C. B. Lowe, H. J. Watson, S. Loraine Foster.

The Committee on By-laws proposed an amendment to Section I, Article viii, as follows: "Section I. Any person approving the objects of the College and its code of ethics may be elected an active member." Action was deferred till the next meeting.

The tellers reported the result of the election as follows: President, Howard B. French; 1st Vice-President, R. V. Mattison, M.D.; 2d Vice-President, Joseph L. Lemberger; Treasurer, Warren H. Poley; Corresponding Secretary, A. W. Miller, M.D.; Recording Secretary, C. A. Weidemann, M.D.; Curator, Joseph W. England; Editor, Henry Kraemer; and Librarian, Katharine E. Nagle.

Trustees: Samuel P. Sadtler, William L. Cliffe, H. K. Mulford and R. M. Shoemaker.

Publication Committee: Samuel P. Sadtler, Henry Kraemer, Joseph W. England, Joseph P. Remington, Charles H. LaWall, George M. Beringer and John K. Thum.

Committee on Pharmaceutical Meetings: Henry Kraemer, Joseph P. Remington, C. B. Lowe, M.D., George B. Weidemann and E. H. Hessler.

Mr. Poley, treasurer-elect, asked for the reading of the By-law relating to the duties of the treasurer. This being done, Mr. Poley asked about bonding the treasurer, as the By-laws require. He could give his personal bond if that was satisfactory, or have the College provide a bond from some bonding company. When Mr. Beringer moved that the matter be referred to the Finance Committee of the Board of Trustees with power to act, so ordered.

Professor Kraemer requested to be relieved as chairman of the Committee on Membership and Professor LaWall was elected to the vacated chairmanship.

C. A. Weidemann, M.D.,
Recording Secretary.

ABSTRACTS FROM THE MINUTES OF THE BOARD OF TRUSTEES.

January 4, 1916.—Fourteen members present. Sub-Committee on Instruction reported that 150 students had availed themselves of the opportunity of joining the Y. M. C. A. Two applications for Associate Membership were received. Committee on Instruction submitted the resignation of one of the assistants in botany, which, on motion, was accepted. Professor Kraemer recommended Joseph O'Reilly as student assistant for the second semester, and, on motion, the recommendation was approved.

February 1, 1916.—Thirteen members were present. Committee on Instruction reported in a preliminary way the proposed course in Physiological Assaying and the teaching of German. The Board approved of the general plan, and the committee was instructed to report more fully at a future meeting.

Mr. Beringer read a communication from Professor Sadtler, in which he tendered his resignation as Professor of Chemistry, to take effect June, 1916. Mr. Poley moved that the resignation be accepted with an expression of deep regret. The Dean spoke very feelingly as to the first break in many years to be made in the Faculty. Mr. Beringer stated that in accepting Professor Sadtler's resignation it was the thought of the committee to ask that he be elected Emeritus Professor of Chemistry, and, therefore, he desired to amend the motion and have the resignation referred to the committee. The amendment was accepted and so ordered.

Professor Sadtler stated that in severing his connection with the College as Professor of Chemistry he intended to keep alive his activities with the College, and would gladly assist in special lecture course or other service.

Mr. Beringer read a communication from Professor Kraemer stating the need of another student assistant for the work of the second semester, and recommended Mr. Harry Ottinger. On motion, the recommendation was approved.

Committee on Examination reported that Louis J. Kleinfeld had finished the course of instruction in Analytical Chemistry, and successfully passed the examinations and is entitled to receive the Certificate of Proficiency in Chemistry. On motion, the certificate was awarded.

The Registrar read a communication from Benjamin C. Quick, Class of 1895, applying for a duplicate diploma, the original having been destroyed by fire. All the requirements having been complied with, it was voted to grant the request.

The Committee on Membership reported favorably on the application of Lloyd P. Griesemer and Philip Fackenthall for Associate Membership. A ballot was taken and they were unanimously elected

ABSTRACT OF ADDRESS OF THE PRESIDENT.

In submitting to you a brief summary of matters that have occurred during the past year in your institution, I am following a precedent which was started the first year after I was honored with the presidency of your college.

During the year it has been necessary to make some unusual repairs to your buildings, and if your financial conditions will admit, it will be desirable during the coming summer months to make some improvements which will necessarily require an outlay of considerable money. Although your property is not in bad condition, it is exceedingly desirable to keep it up to a high standard, and it is for this reason that the foregoing suggestion has been made.

The past session of your college was the first to have re-established a two years' course for a Graduate in Pharmacy (Ph.G.) degree. This course was started to meet the educational demands of an adjacent state, the preliminary requirements for entrance being at least one year of completed high school work, or its equivalent of 15 counts. This course will fully equip the student to pass the examinations of State Boards of Pharmacy and will enable him to successfully practise his profession.

Your Board of Trustees have deemed it prudent to retain the three years' course for a Doctor in Pharmacy (Phar.D.) degree, as it had been very popular with those seeking a higher pharmaceutical education than that extended by some of the other pharmacy schools. This course necessarily requires a higher preliminary education; or, in other words, four years of completed high school work, or its equivalent of 60 counts, 45 of which must be credited to the student before entering the first year, and the remaining 15 counts must be obtained by the student before the beginning of the second year. A three years' course leading to the degree of Doctor in Pharmacy (P.D.) was established under the new arrangement and started with the college year in September, 1915. This will not affect, however, those students who have already completed one or two college years under the former plan for a Doctor of Pharmacy (Phar.D.) degree.

In addition to the two courses above referred to, your Board of Trustees have established a course in Chemistry and Pharmacy, leading to a degree of Bachelor of Science in Chemistry and Pharmacy (B.Sc.). This will require a course of four years, the first two being those given in the Graduate in Pharmacy course, and the preliminary educational requirements will be those required for the Doctor of Pharmacy degree.

In addition to this, special courses in Chemistry, Bacteriology, etc., have been established.

The total number of students attending your college this year is 479, being an increase of 48 over the preceding year. The first year matriculants numbered 173, 11 of whom did not begin the course, as their entrance credentials were not sufficiently high to meet the requirements of the college; 17 are in but partial attendance—this makes the number of the first year class 145 members. The second year matriculants number 125, one of whom is not attending, thus making the class 124 in attendance. The third year matriculants number 124, which, together with 19 hold-overs and 5 not attending, leaves the total number of the third year's class at 138.

The Special Chemistry students number 38.

Food and Drug Course has 4 students.

Special Course in Bacteriology has 29 students, one not attending, making 28 in the class, of which 12 students are regular pharmacy students, 4 are graduates of the Philadelphia College of Pharmacy, and 4 taking the Food and Drug course, 4 Special Chemistry students and 4 new matriculants. There are also two students taking special courses.

There are 52 students doing special work in the chemistry laboratory, of which 19 are third year students and 12 of whom are doing thesis work.

It may not be amiss to call your attention to the fact that among those seeking admission to the college for the term 1914–1915, 7 applicants furnished unsatisfactory entrance credentials; while for the term 1915–1916, 6 applicants failed to furnish satisfactory entrance credentials, and 22 who passed the examination did not matriculate.

Your president regrets to note a falling off in the number of students taking special courses in the chemical laboratory, but this, he feels, was brought about by the unusual conditions existing at the opening of the course, owing to the great war now raging between the prominent countries of Europe, and the consequent unusual demand in this country for men possessing more than ordinary business or scientific knowledge—the demand for which has been unprecedented during the last eight or twelve months.

The recording of attendance of students has been continued as during former sessions and it is gratifying to report that it continues to show an improvement over preceding years.

The change authorized by your board establishing a two years' course has necessarily caused considerable labor in the arrangement of lectures, laboratory work and recitations, and it was necessary to exercise the greatest care in order to see that nothing essential was overlooked or left out of the two years' course. This necessitated the taking of a most comprehensive view of all interests, as well as a most intimate consideration of the necessary details, all of which was most heartily entered into by the faculty of your college. The amount of teaching brought about by the change was most unusual, and the instruction given in the department of pharmacy and others was necessarily greatly increased. Extra lectures on pharmaceutical subjects have been largely augmented and the speakers at these lectures have expressed themselves as being much pleased with the interest which the students took in their addresses.

It is with pleasure that your president reports that this department of your institution has given your students more instruction than was recorded in the roster, and he commends those interested in this department for their activity and enthusiasm.

The new Balopticon lantern installed in the pharmacy lecture room to illustrate upon screens prescriptions, laboratory interiors, special apparatus, etc., has added much to the interest of students in this department.

In operative pharmacy, the course has been most successfully carried on during the session. Originally, operative pharmacy was taught only to the graduating class, but this has now been increased so that all classes in the college receive instruction in this branch, and examinations for promotion are obligatory. In this department, your Committee on Property has erected a large still for distilling water for various departments of your institution, which has proven both economical and most satisfactory.

In the Dispensing Department the students have been taught actual compounding of prescriptions through the selection of typical examples and unusual compounding. They have been instructed in the proper cleaning of bottles, selection of corks, capping of bottles and labelling. Great stress has been placed upon the character of labels used. This instruction, together with what might be termed commercial pharmacy, has aided greatly in preparing young men, not only for their professional careers, but for commercial life. Your college has the honor of being the first institution teaching pharmacy to establish such a training.

The Department of Botany and Pharmacognosy continues to have a steady growth, and it is a pleasure to report that the property entrusted to them has had good, if not unusual, care. The acquisition of 50 new microscopes has aided this department materially and has proven of great benefit to the students. A number of the old microscopes have been sold, yielding a revenue to the college of $472.50, and your professor of this department states that he hopes to dispose of the balance of the old microscopes before the present term is over.

During the past year your professor in this department has gotten out practically a new work on pharmacognosy, which not only does credit to himself but to your institution.

Some interesting research work is being conducted in this laboratory, some of which is of a high character and now has all indications of proving to be of sufficient value to publish in your JOURNAL. One of the subjects being investigated is "The Production of Citric Acid Fermentation by Fungi"; another is "The Morphology and Constituents of the West Indian Cashew-nut," and still another is "The Structure of the Seeds and Pods of Cacao."

Your greenhouse on the roof of your Cherry Street building continues to be of great advantage in the caring for and the studying of medicinal plants. The department expresses the hope that in the near future more extensive facilities for growing plants and studying them at close range may be provided.

It is to be hoped that your institution, at no distant future, may be able to provide for the work in this department which is now almost necessary, and will become more or less imperative with the advanced work which must be expected for the department within the next few years. It is suggested that in this line some thought be given to establishing a memorial in the name of Joseph Carson, whose illustrated work was probably the first to bear the imprint of a professor associated with the Philadelphia College of Pharmacy.

The Martindale Herbarium continues to be of great interest to specialists, and it is to be hoped that arrangements can soon be made to have it cleaned and arranged according to the present system of classification.

Your executive has been in communication with members of the Park Commission trying to arrange to have set aside a space of ground in Fairmount Park to be used as a botanical garden; and while some encouragement has been extended to the project, no definite action has as yet been taken. As stated a year ago, it seems essential that the city or state should assist the educational institutions of Philadelphia in having at their disposal a botanical garden so as to aid in the advanced study of botany and pharmacognosy. It may not be out of place in this connection to suggest that nothing will bring greater lustre to the city of Philadelphia, as a medical centre, than the establishment of such a garden.

Your Department of Bacteriology is meeting with satisfactory results, and the students in same have increased over 30 per cent. It is an interesting fact to note that some of the students in this branch are showing unusual adaptability in this study and it may not require a very great stretch of imagination to state that we can look forward to some of these young men becoming prominent in this line of study and doing credit to their Alma Mater.

During the past year material work has been done in arranging the exhibits in the museum so as to make them more attractive to the visitor. Your surplus specimens have been placed in the old gymnasium, where shelving has been erected to accommodate them; in this way, large quantities of unofficial drugs and specimens are being cared for—many of them in original containers.

Recently, exhibits of licorice and its constituents, as well as exhibits of sugar from its crude to its manufactured form, have been placed in the museum, and your institution is much indebted to the Franklin Sugar Refining Company and the MacAndrews & Forbes Company, Camden, N. J., for these donations.

The portraits in your museum have been rearranged and are now in such a position as to make them far more attractive than in the past.

During the yast year one member has been elected to your organization and one member has died; this leaves your membership as it was a year ago, numbering 141. During the past year two associate members have been elected, making the number now 14. During the year, as stated above, your college lost one member by death, Joseph A. Heintzelman, who died October 19, 1915. He joined the college in 1859 and was a member for 56 years. For many years he was actively interested in the welfare of your institution, and your president wishes to record his regrets at the loss.

Referring to the membership, it seems to your president that a change should be made in your By-laws so as to admit to membership people who are interested in educational pursuits and not to confine your membership, as at present, to those eligible under Section 1, Article VIII, of the By-laws, which reads, "Any graduate in pharmacy, druggist, manufacturing chemist, manufacturing pharmacist, apothecary, or persons associated in allied industries or interests, conforming in professional conduct to the Code of Ethics adopted by this College, may be elected an active member"; and may he not ask whether it would not be better to amend Article VIII to read, "Any person approving the objects of the College and its Code of Ethics may be elected an Active Member"?

It is with extreme regret that your president has to report the resignation of Dr. Samuel P. Sadtler as Professor of Chemistry. He has been connected with your institution for 38 years and has done much to advance the teaching of pharmaceutical chemistry. He has not only honored your institution, but been a great credit to it, as well as increasing the reputation of Philadelphia as a chemical centre. He leaves your institution on account of pressure of personal work, and it is with extreme regret that your Board of Trustees accepted his resignation, which becomes effective June next. Your Board, however, immediately elected him as Professor Emeritus of Chemistry, in which position he will continue to render assistance to your College and will greatly aid the high standard which it has maintained for so many years in the teaching of chemistry.

Your executive greatly regrets that the health of Richard M. Shoemaker, your treasurer, has forced him to decline re-election. He has, however, kindly consented to serve as a member of your Board, if elected to that position. He has served your organization, as treasurer, for nine years, since the death of his predecessor, James T. Shinn, and is the ninth treasurer that your College has had since its organization in 1821. His father was actively identified with the welfare of the institution and it is the hope of your president that if Mr. Shoemaker is elected to fill an unexpired term on the Board that his life may be spared and that we may have the advantage of his coöperation for many years to come.

Your centenary is rapidly approaching and your institution must look forward to meeting it with outstretched hands, ready to take another advance step in your educational standards. Your president desires to express the hope that the men then in charge will have the courage of their convictions so developed as to enable them to stand up before all odds and contend for what they believe to be right, and he sincerely hopes that the satisfaction of having fought for the right, whether they win or lose, will be sufficient justification for showing to the pharmaceutical world their intention of maintaining the present high standard of your institution as a world's leader of pharmaceutical education.

In closing, your executive wishes to express his appreciation for the hearty coöperation which has been extended to him by those officially associated with the College.

Respectfully submitted,

Howard B. French.

March 27, 1916.

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JUNE, 1916

THE OFFICIAL PREPARATIONS OF SENEGA.

By Bertha Mueller, P.D., Assistant Pharmacist at the German Hospital, Philadelphia.

It has no doubt been the experience of many a pharmacist that the official preparations of Senega offer difficulty with regard to elegance and keeping quality.

The U. S. P. Fluidextract of Senega, in spite of its high alcohol content, is an unstable preparation. This is clearly demonstrated by the fact that if the freshly prepared fluidextract is neutralized until faintly alkaline, and set aside, it will be found that in the course of six months to a year from date it has again developed a strong acid reaction, is decidedly less acrid to the taste, reduces Fehling's Solution readily, has a marked methylsalicylate flavor, and will not mix clear with water. These changes are in all probability due to an enzyme present in the drug which causes the glucosidal principle, senegin, to be split up.

Research work has shown that if the crude drug is properly scalded with boiling water, allowed to stand tightly covered for about six hours, then dried in an oven at a moderate heat previous to extraction, these changes will not take place in the finished preparation. The scalding and drying process does not affect the drug in such a way as to make thorough and complete extraction difficult, for repeated biological tests have shown that a fluidextract prepared in this way is hemolytically just as active as a freshly prepared U. S. P. fluidextract is. Both preparations were hemolytically active in dilutions down to a 0.5 per cent. strength.

The present U. S. P. directions for neutralizing the fluidextract are not satisfactory, as the crude drug appears, from a number of samples worked with, to be very variable in acid content. It is therefore not advisable to direct a fixed quantity of alkali to be used for a given quantity of fluidextract. In order to be more exact and not get the preparation either too alkaline or not alkaline enough, the amount of alkali required should, in each case, be calculated according to the acid content of the finished preparation. The most satisfactory way, with the least possible amount of time and labor required, is to make about 100 c.c. of a 1 per cent. aqueous solution of the fluidextract and titrate that with a potassium hydroxide solution of definite strength, preferably a 1–5000 solution, and from the findings calculate the amount of alkali required for proper neutralization. Phenolphthalein is used as indicator.

Considerable work was also done with menstruums of various alcoholic strength, and it was found that diluted alcohol makes quite as satisfactory a menstruum for extracting senega as the official menstruum is. A fluidextract prepared with diluted alcohol keeps just as well and is hemolytically just as active as a fluidextract prepared with the official menstruum. It also yields a rather nicer syrup (if one is content to make the syrup by merely mixing the fluidextract with simple syrup, which is, at best, a rather unsatisfactory method) than the stronger alcoholic preparation does, since there is less fixed oil present in that preparation than in a fluidextract made with a stronger alcoholic menstruum.

A very satisfactory fluidextract of senega may be prepared according to the following formula:

Senega in No. 30 powder....................	1000.0
Boiling water	2000.0
Diluted alcohol, a sufficient quantity to make...	1000.0

Pour 2000 mils of boiling water upon the drug, mix well, cover up tightly and allow to stand from six to eight hours, then dry at a moderate heat, and exhaust the drug with diluted alcohol according to U. S. P. directions. Neutralize the finished preparation with potassium hydroxide solution until faintly alkaline.

The official Syrup of Senega, prepared by simply mixing the fluidextract with syrup is, likewise, a rather unsatisfactory preparation. Within twenty-four hours after it has been made it becomes cloudy and in time stringy, which naturally makes it a very unsightly preparation. Considerable work has been done in trying to prepare a satisfactory syrup directly from the crude drug, but the several formulas that had been advanced and tried out proved quite unsatisfactory. All the samples prepared directly from the crude drug became cloudy and unsightly within three to six months from date, and some samples about a year old had completely gelatinized so that the syrup could not be poured out of the bottle.

A really satisfactory preparation can, however, be made according to the following formula:

Fluidextract of senega	200.0
Sugar	850.0
Purified talc	15.0
Distilled water to make	1000.0

Dilute the fluidextract of senega with 400 mils of water; if acid in reaction, neutralize with potassium hydroxide solution until faintly alkaline. Allow to stand from six to twelve hours, filter through purified talc, and percolate the filtrate through sugar.

This syrup, on biological test, proved to be hemolytically just as active as the syrup prepared according to the U. S. P. method. It is a beautifully clear preparation and remains so for a long time. We have some samples on hand made nearly two years ago that look just as nice and clear as they did when freshly made.

SEASONAL VARIATION IN THE RESISTANCE OF GUINEA-PIGS TO POISONING BY TINCTURE OF ACONITE.

By Charles C. Haskell, M.D.

It has been shown that the chemical assay method for aconite preparations is not to be relied upon.[1, 2, 3, 4] Such being the case, it is important to scrutinize carefully the various physiological methods that have been proposed and endeavor to ascertain which is the most desirable. The attempt has been made in previous papers to show that this scrutiny should be directed chiefly to two methods: the guinea-pig method and the cat method.[5, 6]

The guinea-pig method, proposed originally by Reed and Vanderkleed,[7] has much to recommend it. Guinea-pigs are usually easy to secure and can be kept with little trouble. The technic of the test is very simple, and it can be carried out by a single operator without assistance. Individual variation is not marked, it being unusual for pigs to die "out of order," to use the expression of Vanderkleed. The cat method of Hatcher, on the contrary, necessitates the securing of animals which are, apparently, scarce in certain localities. The cats are prone to develop disease when kept confined for long periods of time; the technic of the test is difficult for the inexperienced; and considerable individual variations are frequently encountered. It has been found, however, that the resistance of guinea-pigs to poisoning by ouabain[8] and by other toxic agents[9] is influenced by season, and it is of importance to ascertain whether the resistance of these animals to poisoning by aconite is not subject to the same seasonal influence.

In October, 1915, a number of samples of tincture of aconite were tested in our laboratory by the guinea-pig and by the cat methods. In order to learn whether the resistance of the pigs to aconite poisoning was independent of season, one of the samples was kept in the original pint bottle and was tested each month since then by determination of the lethal dose for guinea-pigs. The results obtained are given below:

TABLE I

Date	Dose in cc. per gramme body weight	Result
October, 1915	0.009	Survived.
	0.010	Survived.
	0.012	Survived.
	0.014	Survived.
	0.015	Died.
November, 1915	0.012	Survived.
	0.015	Died.
December, 1915	0.010	Survived.
	0.015	Died.
January, 1916	0.010	Survived.
	0.012	Survived.
	0.015	Died.
February, 1916	0.010	Survived.
	0.012	Survived.
	0.015	Died.
March, 1916	0.010	Survived.
	0.012	Died.
	0.015	Died.
April, 1916	0.010	Survived.
	0.010	Survived.
	0.010	Died.
	0.010	Died.
	0.010	Died.
	0.011	Died.
	0.011	Died.
	0.012	Died.

From this table it is evident that no marked variation in the resistance of the animals was present during the months of October, November, December, 1915, and January and February, 1916. In March of 1916, however, a pig succumbed to a dose of 0.012; in the succeeding month, the dose of 0.010 was fatal to three out of the five pigs receiving it; while larger doses than this were invariably fatal.

Liquid galenical preparations that undergo any change on standing generally lose strength. The bottle in which the sample used in these tests was kept was frequently opened, and the possibility exists that evaporation of the menstruum occurred, leaving the aconitine in a more concentrated solution. Fortunately, however, the sample was assayed in November, 1915, by Hatcher's cat method. The results of this assay, carried out on male cats, is given in Table II.

TABLE II.

No.	Weight in grammes	Lethal dose in cc. per gramme body weight
1	3260	0.00981
2	2500	0.00880
3	3010	0.00850
	Average. . .	0.00903

On April 15th and April 17th, this sample was again tested on male cats, with the following results:

TABLE III.

No.	Weight in grammes	Lethal dose in cc. per gramme body weight
1	2950	0.0102
2	3245	0.0123
3	2852	0.0111
4	2875	0.0111
5	3080	0.0111
	Average . . .	0.01116

It would seem, from this second assay by the cat method, that the tincture has not become more toxic, but has, apparently, deteriorated a not inconsiderable amount; the average lethal dose in April, 1916, being more than twenty per cent. larger than the dose determined in November, 1915. It is scarcely probable that the resistance of the cats is greater in the latter month, though the possibility exists.

The following conclusions seem justified:

1. The guinea-pig method as carried out at the present time is unreliable, because it has been shown that season influences in a decided way the resistance of the animals to poisoning by tincture of aconite.

2. The cat method of Hatcher for the assay of aconite is worthy of a more extended trial. From the results obtained with this method in testing digitalis it is improbable that seasonal influences play much of a rôle in influencing the resistance of the animals.

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BACK TO THE CHEMIST'S SHOP.

By C. FERDINAND NELSON, Associate Professor of Physiological Chemistry,
University of Kansas, School of Pharmacy.

There is something eminently proper, dignified, and altogether fitting in calling a drug store by its English title—The Chemist's Shop. That is precisely what it should be, but sadly enough in America to-day, seldom is. When we speak of the chemist's shop, it immediately calls to mind the many struggles, trials, and hosts of associations of the past. It explains, in a measure at least, our evolution as a distinct group of men devoted to a definite calling. It shows also very clearly how intimately pharmacy and chemistry have always been associated with each other and how the two have gone hand in hand until recent years, when, with the tremendous accumulation of chemical data in numerous fields not directly associated with medicine, it has become a profession of its own already highly specialized and divided. Historically the pharmacist has a good right to be called a chemist; logically and practically that is precisely what he ought to be, at least in part, and in this capacity he should serve the community in which he lives and labors. The pity of it is that instead of anchoring ourselves to the past, and from this sure point of vantage advance into the future, we are setting out upon a sea of pure commercialism, going we know not whither, and entirely forgetting our true place and function as professional men.

But let us ask, can the pharmacist of to-day afford to let go of this rich heritage of the past? Should he sever all real connection with things chemical and devote himself entirely to other fields of endeavor? Is it desirable that the extreme commercialism which has already made such destructive inroads upon our retail drug practice should continue? Evolution implies growth; advancement means progress. We cannot stand still; we must either grow or decay. And there are few of us who will not be forced to admit, if we be honest with ourselves, that however keen and progressive we may be as men of business, we are miserably lacking when it comes to professional strength and development. If we would continue, therefore, to call ourselves pharmacists and professional men, we must begin a radical improvement in our methods and practice.

Many pharmacists have for years cherished as an ideal the idea of operating a drug store in which only physicians' prescriptions were compounded. It is reasoned thus: "If we could only get rid of the side lines, such as patent medicines, cigars, sundries, and the like, with which we are now burdened, but which we find absolutely necessary to keep us alive, how happy we would be. Then could we be real pharmacists. This is the goal for which we would strive." The real drug store, they would say, is the one that only compounds physicians' prescriptions and sells drugs. To them to be a prescription compounder covers all that the word pharmacist implies. Here they reach their goal; their professional ambitions are satisfied.

That this point of view is better than a purely commercialistic one is undoubtedly true; and yet we have all of us witnessed many pharmacists failing miserably because of their inability to secure an adequate patronage when attempting to conduct their business purely along these lines. A pure prescription business is undoubtedly desirable, and yet when all is said, to be only a compounder of drugs must not be the only aim of the pharmacist nor must this occupy all of his time and energy. The pharmacist who, in the future, decides to establish a business of this sort, ignoring all else, will probably meet the same fate that his brother pharmacist has in the past. If an exclusive prescription business has been impossible in the majority of instances in the past, the changing conditions of the present make a similar attempt to-day harder than ever to realize. *We must not ignore the fact that the profession of medicine is marching onward at a tremendous rate, and that the practices which pertained yesterday do not hold at all to-day.* When I was an apprentice in pharmacy, twenty odd years ago, every prescription that came into the store usually consisted of mixtures of four, six or eight ingredients. I well remember hearing my employer say this or that physician who did not prescribe a vast, complex mixture did not know very much. He was a poor doctor or he would have written a more complex prescription. But witness the change. Every year that goes by finds a decrease in the number of drugs used. Prophylactic medicine is taking its hold. We are curing diseases nowadays by keeping our bodies fit, by proper food, by pure air, by mental suggestion. The pharmacist cannot fill these prescriptions, and so the old idea of an exclusive prescription store, however desirable it may have been, must be abandoned.

To say this does not mean to say that the physician will cease to write prescriptions. On the other hand it seems rather safe to say that as the educational requirements and professional training of the physician increase, he will progressively abandon dispensing his own medicine, as he now often does, and leave that work to the pharmacist. There will thus be more prescriptions written by different men, but in all probability each man will not write as many prescriptions as he formerly did. Physicians will not be as elaborate in the number of ingredients and variety of drugs used. There will be no need of carrying a huge stock of pressed herbs for making infusions, an endless assortment of plasters and salves, hundreds and hundreds of pills, fluidextracts, elixirs, and syrups. There will rather be a few drugs of recognized value whose strength will be carefully standardized and whose action, well known. These it will be the duty of the pharmacist to dispense.

And again, the preparation of the few drugs the physician will use will in all probability be best carried out by the large first-class pharmaceutical houses now in existence, who have every facility for collecting, preparing, examining, and properly checking the raw and finished products, which the retail pharmacist with his little store possibly cannot have. And there should be no difficulty for us in accepting this point of view. We should not be so loath to stop making a few galenical preparations which we have heretofore considered as a mark of our professionalism. If we but consider, we will remember that one-half to three-fourths of the drugs we have always used have been made, not in our own stores, but in the larger manufacturing establishments. For example, few pharmacists have ever felt that they should make their own pepsin, pancreatin, or oil of wintergreen. Why, then, should we care if the percolators in the back rooms of our stores are not turning out a few such simple preparations as tr. arnica, tr. opium, or fluidextract or sarsaparilla? To be sure, the prospective pharmacist should be taught how these preparations are made and actually to make them in his preliminary college training, just as he should also be instructed concerning all the known drugs in the materia medica, whether they are for the moment in actual use or not. But in his actual retail practice, he can well afford to abandon this time-consuming and not particularly skilful work and devote himself to the chemical and pharmacological examination of the finished products he buys. As prescription specialist, he should rather serve his customer by guaranteeing the strength and reliability of the few ingredients he puts into the prescriptions that he compounds, that incompatibilities are avoided, and that the dose is safe and accurate.

Where, then, you will say, is our field? If we cannot hope to do an exclusive prescription business, if we must even abandon the preparation of the drugs we use in our prescriptions to manufacturing houses, are we not doing the eminently proper thing by increasing our side lines, by changing to the opposite extreme and becoming purely commercial in our methods? No! a thousand times, No. Let us rather shift our point of view; adjust ourselves to the conditions we find ourselves in; abandon some of the ideals we have had, and in their place adopt newer, better, and larger ones.

The young man who has graduated from a first-class school of pharmacy has received, in addition to his training in botany, pharmacognosy, materia medica, prescription compounding, and galenical preparations, a good training in inorganic and organic chemistry, in qualitative and quantitative analysis. He may, especially if he has elected a three- or a four-year course, even have taken one or two courses in drug analysis, bacteriology, food analysis, sanitary and water analysis. On the whole he has a more thorough training in these subjects than the physician has. He is really better fitted, therefore, to undertake analytical work along chemical and bacteriological lines than the physician, who has to devote his energies chiefly to surgery and diagnosis. Now, if the practice of medicine is becoming more simple, so far as the administration of drugs is concerned, it is becoming ten times more complex and elaborate as regards chemical and bacteriological examination of body fluids for the purpose of diagnosis. These absolute checks are increasingly being demanded by the physician who, in anticipating disease, will advise his patients that analyses of this sort be made at regular intervals rather than wait until they are actually stricken. Beginnings of this sort are seen even now in our large cities, where certain physicians are devoting themselves to doing analytical work for their colleagues rather than entering into regular practice for themselves. *The modern pharmacist could and should do this work.* He has the better chemical training, has a large store which he can use for a laboratory, has an abundant stock of chemicals and other supplies which are needed for carrying on this work. All he needs to do is to familiarize himself with the special technique of these methods, which is easily done, granting that he has the preliminary training we have spoken of. The physician, moreover, will welcome a departure of this sort on the part of the pharmacist, because he has not the time or the energy to keep adequately informed on the details of this work and would gladly turn it over to the pharmacist, did he but know that he would handle it. There is a vast amount of this diagnostic laboratory work, which awaits but the proper men to do it. Suppose, now, that the pharmacist did devote himself along these lines. Suppose he established a department of this sort in connection with his retail practice. He could, in a short while, if he gave it proper attention, abandon selling many of the sundries which he has no interest or desire to sell. He could devote himself to this work and in addition maintain his prescription department, and this combination would give him ample field for all of his energy and in addition make him a truly professional man. To make the statements that I have made specific, I have drawn up the following list, which includes some of the analyses physicians might desire to have made in relation to their work in diagnosis. The beginnings made along these lines could be slow and modest, and as the business developed, the field could be enlarged.

Detection of tubercle bacilli in sputum.
Detection of diphtheria bacilli from throat swab.
Detection of malarial parasites.
Counting of red blood-corpuscles.
Counting of white blood-corpuscles.
Differential blood-count.
Per cent. of hemoglobin.
Widal test for typhoid fever.
Wassermann test for syphilis.
Complement-fixation test for gonorrhœa.
Examination of smears for gonorrhœa.
Identification of blood-stains.
Preparation of autogenous vaccines.
Preparation of sterile bandages, sterile water, and other solutions, syringes, needles, etc.
Examination of milk.
    Specific gravity.
    Reaction.
    Total protein.
    Casein.
    Fat.
    Milk-sugar.
    Detection of preservatives.
        (1) Sodium carbonate.
        (2) Salicylic acid.
        (3) Formaldehyde.
        (4) Boric acid and borax.
Hydrogen-ion concentration of urine and fæces.
Examination of gastric contents.
    Detection of free hydrochloric acid.
    Detection of butyric acid.
    Detection of acetic acid.
    Detection of pepsin.
    Detection of rennin.
    Detection of protein digestion products.
    Detection of carbohydrate digestion products.
Quantitative determination.
    (1) Of total acidity.
    (2) Free acidity.
    (3) Combined acidity.
    (4) Acidity due to organic acids and acid salts.

Urine.
  Qualitative examination.
    Specific gravity and reaction.
    Albumin.
    Sugar.
    Acetone.
    Diacetic acid.
    Indican.
  Quantitative determinations.
    Total nitrogen (Kjeldahl).
    Urea (Van Slyke's Urease Method).
    Uric acid (Folin's microchemical method).
    Chlorides.
    Dextrose (Benedict's method).
    Albumin (Folin's turbidimetric method).

There is but one drawback to our entering this profitable phase of truly professional work and that, I am sure, is none other than the pharmacist's tremendous inertia and lack of confidence when dealing with things professional, his phobia of not daring to proceed along these lines from the known to the unknown without some one to show him exactly what ought to be done and how to do it.

The work mentioned above refers only to a few of the diagnostic methods which the physician requires. But the pharmacist's possibilities in chemical and bacteriological work, if he once enters upon this field, do not by any means end here. He may, for example, in addition devote himself to the analysis of foods and food products, milk, cream, cooking oils, fats, meats, candies, flavoring extracts—all commodities, in fact, which are used as foods, or he may make sanitary water analyses, gas analyses, iron and steel analyses, the various analyses required of him in his capacity as city chemist. The field is limited only by the energies which he chooses to put forth. *Why can we not, as a profession, begin, at least in a small measure, to abandon the selling of soda-water, cigars, sundries, paints, and ham sandwiches, for this more skilful, and more truly professional work?* Our preliminary training has been all along these lines. Why should we not make some use of the information we have spent so long a time acquiring? It is granted that the beginnings will be hard, but that should make us all the more eager to attempt them.

STATE BOARD EXAMINATIONS.*

By Robert L. Morland, Member of the Minnesota State Board of Pharmacy.

It has often been the subject of comment and inquiry that so many candidates fail in the examinations conducted by our Board. There are various reasons for these failures. The Board arranges its examinations with the greatest possible care, and spends more time in conducting them and marking the results than probably any other board in the country. It endeavors, so far as possible, to avoid questions which necessitate memorizing abstract facts of no particular value, and avoids difficult prescriptions and incompatible preparations. But it is very difficult for a board to frame questions and assign practical work that will fit the mental capacity and mechanical ability of the majority of the candidates who appear before it, unless such board considers its work merely a perfunctory duty, to be disposed of in the easiest manner and in the least possible time.

The prevailing thought among the candidates of to-day seems to be to get through every task with the least possible exertion; and, therefore, it is impossible for these to show even fair knowledge or skill in pharmacy in the length of time they devote to the study of it and the manner in which they use their time.

The idea seems to be general that a thorough knowledge of pharmacy may be obtained by the average student after four years' experience in a modern drug store, or two years in such and two years in a school of pharmacy. Such a feat is not impossible, but the students who would burn the amount of midnight oil necessary to its accomplishment are comparatively few.

The young people of to-day, as a class, are not studious; they are pleasure-loving. At school, college, and university they waste a great deal of valuable time in outside activities and social enjoyments, and "cram" for examinations.

I am a firm believer in a proper amount of recreation and social enjoyment, but these should never be allowed to interfere to any serious extent with the course of study. There are, of course, in every school some who can devote a great deal of time to matters outside of the prescribed course and still keep their work up to a high level, but the majority cannot do this. When those who have wasted valuable time in one way or another appear as candidates before a quasi judicial body, such as a Board of Pharmacy, and are given examinations to determine how much of their education has been retained and how much has filtered through, then we hear complaints of the unfairness of some of the questions, the difficulty of the examinations as a whole, or the objectionable personalities of the examiners as excuses for ignorance, carelessness, or both combined.

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* Read before the Scientific Section of the Minnesota State Pharmaceutical Association, Minneapolis, February 9, 1916.

In case you may think these strictures too severe, let me give you a few answers, taken at random, from recent examination papers:

"Rhizomes are Mediterranean stems which grow underground."

"Pilocarpus is broom tops."

"Phenol is obtained from the destructive distillation of wood."

"The source of phenol is the mines of Germany."

"Pepsin is taken from the inside of a hog; the pancreas is taken out and dried and kept in air-tight bottles."

"Pancreatin is taken from the calf. It is prepared in nearly the same manner as pepsin."

These last two answers are by the same candidate.

"A fixed oil is an oil that is made by distillation or other process, and an essential oil is an oil made artificially by dissolving in an alcoholic solution, such as perfumes, etc."

"State source of paraffin." Answer: "From the whale."

"Pepsin is found in the lining of the abdomen of the hog."

These last two answers are from graduates in pharmacy.

"Pepsin is found in the bile of a sheep. Pancreatin is from the fat of a hog. Pancreatin is obtained from hops or barley. Linseed oil is obtained from the cotton seed."

All of these are answers from the written portion of the examinations.

Now let me give you a few examples of how the practical work was done. Every candidate is compelled to bring with him a copy of the U. S. P. and N. F., and they have these books before them in all practical work.

"Prepare one dozen compound cathartic pills," was one of the instructions given at the last examination. The completed pills varied in weight from 22½ to 80 grains. Another example was: "Prepare six Seidlitz powders." Many of the candidates did not weigh the powders, but divided them by eye, with the result that the blue papers varied in weight in the same half dozen from 16 to 53 grains. Several of those who weighed the powders had differences of from 15 to 30 grains, and in one case 9 grains difference in the white papers. This set of Seidlitz powders, which I now present for your inspection, was made by a candidate who has had three years' experience in a drug store, but has never attended a school of pharmacy. He thought he had a good chance to become a registered assistant by examination. He had never seen the inside of a Seidlitz powder. He had never sold one except in the original wrapped packages bought from the manufacturer. The blue papers contain about 1½ grains each and the white ½ grain.

A prescription for an ointment was presented containing one drachm of mercury and two drachms of wool fat. One candidate turned in 4 drachms and 18 grains of finished product, another three drachms and 38 grains, and in both cases a considerable quantity was left in the mortars.

Another candidate asked for and obtained nitric acid to extinguish the mercury before adding the wool fat. Another used 1 drachm of mercuric iodide (which had been supplied for making Donovan's solution) instead of mercury.

At an examination some time ago a candidate was asked to make 12 pills of aloin, strychnine, and belladonna. He took the quantity for 100 pills and divided it into 12. Scores of examples similar to the above could be taken from the results of every examination, but I think I have given enough to account for the percentage of failures being as great as it is.

Such answers show ignorance, carelessness, and lack of reasoning power, yet all of the candidates who wrote these and did the practical work just mentioned believed themselves qualified to act as pharmacists or assistant pharmacists.

What is most needed to raise the percentage of success in our examinations is to rid ourselves of the idea that a knowledge of pharmacy sufficient to entitle a person to practise it with safety to the public can be obtained in a "catch-as-catch-can" manner. It cannot be obtained by simply putting in the prescribed time in the average drug store without systematic study, or by merely attending classes in a school or college of pharmacy. Pharmacy to-day is more complex than ever. The old order of things has changed. New drugs are being used and more complex preparations are in vogue than ever before. The standards of quality for all drugs are being raised, and the tests for purity increased. The pharmacist of to-day is expected, and rightly so, to be able to determine the quality and purity of the substances he uses; thus the demands made upon the student of pharmacy are constantly increasing and more time and study are required than ever before to meet modern conditions—probably more, you may say, than the remuneration of the calling warrants; but that is the fault of business conditions, not of the practice of pharmacy.

QUARTERLY REVIEW ON THE ADVANCES IN MATERIA MEDICA AND PHARMACY.

By John K. Thum, Ph.G., Pharmacist at the German Hospital,
Philadelphia, Pa.

Higher prices for drugs and chemicals still obtain all along the line, and there seems to be no likelihood of any breaks in that line in the near future. Naturally, a situation like this engenders more or less comment from every one. Indeed, very few escape being affected by this unprecedented era of high prices, which not only obtains in our calling, but exists in all spheres of business activity.

Editors of lay journals, newspapers, and magazines, to say nothing of pharmaceutical journals, appear to be almost unanimous in the opinion that this era of higher prices is to remain with us for some time. Some assert that the ending of the war will not mean an ending of this upward tendency of prices, and one is so bold as to say that after the war, instead of a reduction in the prices of commodities, prices will be still further advanced. From the standpoint of the buyer this is indeed pessimism! We are unable to agree with this view of the situation. After the cessation of hostilities there will be a large number of men return to work; labor, both skilled and unskilled, will be cheap as compared to the present or even prewar times, and in this country the vast number of men who have been engaged in the manufacture of war material will return to, or at least be available to engage in, the manufacture of things of a more pacific nature. It must also be remembered that at the close of the war the present embargoes maintained by nearly all of the belligerents will be raised; and surely this must also prove something of a factor in bringing the cost of at least drugs and chemicals to something near their former prices.

The experiences that the people of this country are going through while this terrible war is in progress certainly must prove a stimulus and an aid to the development of the potential resources and latent genius that this nation undoubtedly possesses.

The department of "Therapeutics" in the *Journal of the American Medical Association* often contains information and comments about advances made in medicine that should be, and are, of interest to pharmacists. In the last few years much has been written about the cardiac tonics, particularly digitalis and, to some extent, strophanthus. Any new facts that are brought out concerning these drugs, and preparations of these drugs, that are backed up by animal experimentation must appeal to the conscientious physician and should, of necessity, be of interest to the wide-awake pharmacist. Much of this work has been done by Hatcher and Eggleston. Concerning some of their more recent work "Therapeutics" has this to say, and, as we are just now passing through a period of "fat-free" digitalis agitation which hits the medical profession every now and then, this comment is peculiarly appropriate:

"Several years ago Hatcher and Eggleston investigated the emetic action of digitalis. Their results showed that the digitalis bodies produce nausea and vomiting through action on the vomiting centre in the medulla. The direct action of therapeutic doses of these drugs on the gastric mucous membrane is unimportant. The fixed oil or fat from digitalis, to which the emetic properties are sometimes attributed, was given to cats in large doses without producing any symptoms whatever. It is clear, therefore, that efforts to avoid nausea by removal of the oil, administration through other channels than the stomach, or any other means than regulation of the dose must prove unavailing. It might naturally have been expected that the same conclusions would apply to strophanthus preparations, especially as no satisfactory evidence has been presented in support of the claim that the oil present in tincture of strophanthus helps to produce the nausea which sometimes occurs after its use. Hatcher has performed experiments with oil of strophanthus which show that this assumption is justified. He finds that the average therapeutic dose of the tincture of strophanthus contains less than one ten-thousandth part of that required to produce nausea and vomiting in the cat, relative to the weight. While removal of the oil renders the tincture more 'elegant' pharmaceutically, such removal is of no therapeutic importance." (*Jour. A. M. A.*, April 15, 1916, p. 1199.)

THE STANDARDIZATION OF DIGITALIS AND THE POTENCY OF AMERICAN-GROWN DIGITALIS.—A comparison of American-grown digitalis leaves with those obtained from other sources showed that it is possible to grow leaves of a very high quality in this country. This was proved by biological determination. The experimenters worked with an infusion of the leaves and used Hatcher's "cat" method of standardization in preference to the so-called "frog" method. In their opinion, the latter method is less reliable than the former. It will be remembered that the "cat" method is comparatively simple and consists in determining the minimal fatal dose per kilogramme weight of cat, the drug being injected slowly into the femoral vein. They agree with Hatcher that the infusion does not deteriorate as rapidly as commonly believed; they also make the statement that there are differences in activity due to the method of preparation; they also believe that we have in America a digitalis that cannot be surpassed. They also make the statement that "the name of this or that firm does not always insure potency or digitalis effect." Altogether this is a most valuable paper and a distinct contribution to the positive knowledge concerning digitalis that is gradually being added to the literature of this well-known drug. (*Jour. A. M. A.,* March 18, 1916, by L. G. Rowntree, M.D., and D. I. Macht, M.D.)

DIGITALIS STANDARDIZATION. THE PHYSIOLOGICAL EVALUATION OF FAT-FREE DIGITALIS AND COMMERCIAL DIGITALIN.—In an endeavor to discover the activity of some commercial preparations of fat-free digitalis and German digitalin the following conclusions were drawn: The biological determination was carried out by the one-hour frog method. This method was selected because it is generally conceded that the various factors which must be considered in this method of assay are kept uniform. Absorption from the lymph system of the frog was found to be variable and to depend somewhat on the temperature at which the frogs were kept while assayed. A variation of over 250 per cent. was discovered in 13 samples of commercial fat-free digitalis and 150 per cent. in five samples of commercial digitalin (German). There is no difference in the qualitative effects of fat-free digitalis on the dog as compared to those produced by the official tincture; and the difference in the absorption between these two different tinctures from the lymph system of the frog is so slight as to be unworthy of notice. Some of the samples of fat-free digitalis showed considerable deterioration after being kept under ordinary conditions for a period of from five to seven months. It is suggested that manufacturers adopt a uniform method of assay and a standard of activity. Only thus can physicians get uniformity, which they have a right to expect when they prescribe commercial preparations of digitalis. In view of the rapid deterioration of commercial preparations of fat-free digitalis it is deemed advisable that such preparations be dated, so that physicians have some means of knowing how old a preparation they are prescribing for their patients. (*Hygienic Laboratory Bulletin* No. 102, by George B. Roth, M.D.)

FEDERAL STANDARDS FOR MINERAL WATERS.—In no other country in the whole world is there such a large sale and consumption of mineral waters as in these United States. Recognizing this fact and the belief that the public has, generally speaking, of taking the purity of these waters for granted, the government has, through the activity of the Public Health Service, adopted the following standards. The authorities believe that these requirements are not too stringent to apply to waters that are imported from abroad.

1. The total number of bacteria developing on standard agar plates, incubated 24 hours at 70° C., shall not exceed 100 per cubic centimetre; provided that the estimate shall be made from not less than two plates, showing such numbers and distribution of colonies as to indicate that the estimate is reliable and accurate.

2. Not more than one out of five 10-mil portions of any sample examined shall show the presence of organisms of the *Bacillus coli* group.

It seems that the Bureau of Chemistry has been giving this matter of the purity of these waters considerable investigation for some years, and the above standards are the result of its investigations. Thus mineral and table waters that are offered for sale in interstate commerce are required to conform to these standards, and those of the public who are wont to use these things are guaranteed some measure of protection against careless and unhygienic handling of these waters by those who bottle them.

HISTORICAL REVIEW OF SOAP MANUFACTURING.—In this contribution much interesting information is given concerning an industry the products of which are used by all civilized peoples. The author briefly traces the history of this ancient industry from biblical times down to the present time of manufacture, when all the resources of the latest scientific knowledge are utilized in this interesting and necessary industry. An experience of over forty years in the manufacture of soap is also drawn upon by the author in presenting this interesting paper. The statement is made that soap has been found by bacteriologists to be strongly antiseptic and disinfectant. It may also be of interest to know that at the meeting of the International Congress of Zoologists in 1907 a paper was read in which the writer made it clear that the "insecticidal value of soap is very considerable." Taking it all in all, this brief paper contains much that the retail pharmacist should know. In 1909 the soap made in this country was valued at $111,357,777, and the number of persons engaged in the manufacture was 18,000; this will give some idea of the magnitude of this business. (*Jour. of A. Ph. A.,* March, 1916, p. 295, by Joseph Abraham.)

LOSS OF WEIGHT OF MUSK.—It is stated that when dry musk is exposed to a current of dry air for about seven months it loses weight, and when the loss of weight ends the musk is without odor. Furthermore, the odor is not restored by exposure to damp air. (*Jour. of The Franklin Institute.*)

HEXOPHAN.—Used in the treatment of gout and rheumatism and is said to be oxyphenylchinoline-dicarbonic acid ($C_{17}H_{11}NO_5H_2O$), and to be made by the condensation of acetylsalicylic acid and isatine, which are heated together in an alkaline solution. The oxyphenylchinoline-dicarbonic acid obtained is purified by conversion into the sodium salt or the methyl ester. It is a yellow powder, without smell or taste, nearly insoluble in water, alcohol, and ether, and in warm hydrochloric acid, but soluble in ammonia and solution of sodium hydroxide. (*The Chemist and Druggist,* March 18, 1916, p. 40.)

TESTS FOR GUM ACACIA.—A publication of the United States Bureau of Standards contains interesting data concerning many of the published tests for acacia and gives descriptions of efforts to find others. It is said that basic lead acetate gives the most characteristic reaction, while solutions of copper and sodium hydroxide and of neutral ferric chloride and alcohol are of value as confirmatory tests. A summary is given of the more important methods that have been proposed for the quantitative estimation of gum arabic, followed by a description of the steps that led the investigators at the Bureau to the use of alcoholic copper acetate-ammonia solution for this determination. Dextrin and ghatti gum were also subjected to the same tests.

MEDICAL, SCIENTIFIC, EDUCATIONAL AND PHILANTHROPIC INSTITUTIONS NOT TO BE AFFECTED BY FIXED PRICE LEGISLATION.—Senator Ashurst, of Arizona, has introduced a bill into the Senate which provides that a grower, producer, manufacturer, or owner of an article having a trade-mark or special brand, who sells it to a dealer or retailer, can designate and prescribe the price at which it shall be resold, the object, of course, being to prevent the cutting of prices. In this bill, however, it is expressly provided that the act shall not apply in cases of sales of such articles to any society or institution established solely for educational, medical, scientific, or philanthropic purposes. (*Jour. A. M. A.*, March 25, 1916, p. 67.)

MAGNESIUM HYPOCHLORITE AS A DISINFECTANT.—The advantages claimed for this chemical over other hypochlorites as a disinfectant and germicide are that it is more powerful as a disinfectant and at the same time less caustic. It is also much cheaper; other things being equal, this is a desideratum not to be ignored. It is prepared for use by dissolving 190 grammes of magnesium sulphate in 2 litres of water and mixing this with 2 litres of water into which 100 grammes of chlorinated lime have been well stirred. The two solutions are first filtered before mixing; the resulting precipitate is allowed to subside and the clear supernatant liquid, preferably filtered, is then ready for use. This can be used freely as a dressing, as it has no untoward action on the healthy tissues. It is asserted that the organism bears the magnesium well—in fact, much better than can be said of either lime or sodium. (*Jour. A. M. A.*, March 25, 1916, from the *Paris Médicale*, Feb. 19, vi, No. 8, p. 197, by C. Mayer.)

THE THERAPEUTIC VALUE OF THE HYPOPHOSPHITES.—In order to be classed as a useful drug it is necessary that a drug be able to accomplish one of three things: (1) It must have either a local or a physiological action; (2) it must show a particular influence on pathological processes, and (3) it must have food value. After a brief review of the literature pertaining to the hypophosphites the writer of this paper adduces evidence, both of a clinical nature and the study of the effect, or lack of effect, of this drug on animals. The conclusions are that the hypophosphites as a source of phosphorus for the body are without value. No evidence is adduced showing that they have any physiologic effect; that they have any influence on pathologic processes; that they have any value as a food. The author tersely adds: "If they are of any use, that use has never been discovered." (*Jour. A. M. A.*, Feb. 12, 1916, p. 488, by W. McKim Marriott, M.D.)

LABORATORY NOTES ON COLOR TESTS.—The following is submitted as a reliable test for the identification of caramel in flavoring extracts:

Tannic acid	1.00
Sulphuric acid	0.75
Water to make	50.00

The tannic acid is dissolved in 30 mils of water, the H_2SO_4 is added, and, after the precipitate which is formed is dissolved, the quantity is made up to the required weight. This solution is useful in detecting caramel in many things, such as whisky, brandy, flavoring extracts, ready-made medicines, and vinegar. The method of applying the test is as follows: To the suspected liquid (5 mils) an equal amount of the test solution is added; the mixture is slightly heated and allowed to stand 24 hours; at the end of that time, if caramel be present, a dark-colored precipitate will be present. (*Jour. A. Ph. A.*, March, 1916, p. 294, by G. H. P. Lichthardt.)

A NEW COLOR REACTION FOR ALOES.—A permanent pink color is obtained by the addition of a freshly made solution of potassium ferricyanide to a cold aqueous solution of Barbadoes aloes. This color is delicate enough to be discernible in dilutions of 1 part in 10,000. The strength of the test solution must be in proportion to the strength of the solution of aloes to be tested; if either is in excess, no coloration is obtained. It takes from five to fifteen minutes for the color to appear, but the reaction is materially hastened by quickly heating to boiling. Cape and Socotrine aloes do not give this reaction; instead, they show an emerald-green color not quite as delicate as the Barbadoes aloes, but sufficient to show 1 in 250 of Socotrine aloes, and is somewhat less delicate with Cape aloes. This reagent gives with commercial aloin a green color. Brought in contact with the extracts of cascara sagrada and rhubarb no reaction is given, showing that no color is produced by frangulin, frangulic acid, or chrysophanic acid. The color is destroyed by acids and small quantities of alkalies intensify the reaction and at the same time modify it by giving it a brown tint. (*The Analyst*, March, 1916, p. 75, by C. E. Stacy.)

THE ESTIMATION OF FREE ALKALI IN SOAP.—The customary method for estimating the amount of free alkali in soaps is to dissolve the soap in alcohol, filter, and titrate the free alkali with standard acid. This method, however, has its disadvantages and is most unsatisfactory to most workers. The method recommended by the writer of this paper is practical and accurate. Briefly, it is based on the salting out of the soap from its aqueous solution with sodium sulphate and titrating the free caustic alkali with standard acid; silver is used as a spot indicator. Ten grammes of soap are placed into a wide-necked flask, 50 mils of distilled water are added, the flask lightly stoppered, and the contents heated until solution has been effected. Fifty mils of hot saturated solution of sodium sulphate are added and the precipitated soap separated and washed with a small quantity of sodium sulphate solution. The carefully gathered liquid is then titrated with $\frac{N}{10}$ sulphuric acid, using a 5 per cent. solution of silver nitrate as a spot indicator on a porcelain plate. A brown stain of silver oxide appears so long as free hydroxide is present; carbonates, silicates, etc., do not interfere in any respect with this reaction. Naturally, the silver nitrate and the sodium sulphate should be first tested for neutrality. The results are accurate and the method is delicate enough to permit of the determination of 0.01 per cent. of caustic alkali when added to a neutral soap. (*J. Soc. Chem. Ind.*, 1916, 35, 95–96, by F. H. Newington, through *The Analyst,* April, 1916.)

Alleged Occurrence of Hydrocarbon Oils in Mediterranean Fish-liver Oils.—An examination of a recent shipment of fish-liver oil to London revealed that it contained, or was supposed to contain, mineral oil. As much as 83 per cent. was shown to be unsaponifiable fat. In an endeavor to trace the source of this the investigator extracted the oils from the livers of fresh Mediterranean fish; the oil obtained from two distinct species, *Centrophorus granulosus* and *Scymnus lichia,* contained in the neighborhood of from 80 to 90 per cent. of an unsaponifiable liquid hydrocarbon having all the characteristics of mineral oil. The revelation of this fact is decidedly interesting, as it in a large measure supports the theory of the animal origin of petroleum.—(*Chem. Zeit.*, 1915, 39, 889; *Chem. Abstr.*, 1916, 10, 285, H. Mastbaum.)

Hexaiodine.—This easily remembered name—and that is the reason it is given to the medical profession, whose use of it will teach the laity how to ask for it direct from the distributer—is, chemically, hexamethylenetetramine monohydriodide. It is a white, odorless, crystalline powder, melting at 70° to 171° C., and is very soluble in water. It is said that the solutions have a slightly alkaline taste. It is also claimed to be well suited for the administration of iodine, since it can be administered in very large quantities without producing iodism. This may be so, but it naturally suggests that it probably contains much less iodine than other chemicals or combinations of this well-known and valuable element. It can be given hypodermically as well as by mouth. (*Chem. Abstr.,* 1916, 10, 369, through *Chemist and Druggist,* March, 1916.)

Indian Opium for Medicinal Use.—Some recent investigations undertaken at the Imperial Institute revealed the fact that it is possible to produce opium in India containing considerable morphine and entirely suitable in many ways for the manufacture of galenical preparations. Assays carried out on 102 samples revealed that the average amount of morphine in 51 samples was 10.26 per cent., calculated on dry opium. Twenty-one samples gave 7.5 per cent. of morphine. It was found that only 30 per cent. of the samples were so deficient in morphine content as to be unfit for medicinal use in the United Kingdom. The codeine content was also found to be considerable. In fact, Indian opium is now being very largely used in the United Kingdom for the making of codeine and morphine. In India it is the custom to mix the opium of commerce with more or less oil; this custom should be stopped, especially in that intended for chemical or medicinal use. It can be readily seen that such addition necessarily lowers the alkaloidal content; moreover, it also renders the opium unsuitable for the manufacture of pharmaceutical preparations. (*Bull. Imp. Inst.,* 1916, 13, 507, through the *Pharmaceutical Journal and Pharmacist,* March 25, 1916.)

THE TECHNICAL PRODUCTION OF HYDROGEN AND ITS INDUSTRIAL APPLICATION.[1]

By Harry L. Barnitz, Ph.G.

Prior to the year 1907 little importance was given to the technical production of hydrogen gas. Since then, however, the application of hydrogen gas has been continuously and rapidly extended. With the development of the dirigible airship in Germany, it was imperative that hydrogen be cheap and easily obtainable in large quantities. Accordingly the development of the airship may be considered the chief stimulus in the technical production of hydrogen. Germany, France and England have been the principal countries to first utilize the gas commercially. To Germany credit must be given for being the first, not only in developing its technical production, but also in extending its application. In the United States, hydrogen is continually increasing in importance in the industries, but prior to 1913 only little was used.

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[1] Reprinted from *Metallurgical and Chemical Engineering,* vol. xiv, April 1, 1916.

For the autogenous welding of steel, cast-iron, wrought iron, copper and aluminium and its alloys, hydrogen in combination with oxygen is finding continued increasing application. Hydrogen here presents the great advantages of wide applicability, cleanliness, and cheapness. Another use which is constantly extending is in the cutting of wrought iron and steel. The oxy-hydrogen flame will cut metal up to 24 inches in thickness. In the cutting process considerable excess of oxygen is required, whereas in the welding process a reducing gas mixture is used. The cuts are cleaner than those of a saw, and even in thick metal are only ⅛ of an inch in width. The rapid extension of the cutting practice by the oxy-hydrogen process is due to its convenience, simplicity and cheapness. The oxy-hydrogen flame is also used for melting quartz and platinum, in lead burning, in the manufacture of synthetic jewels such as ruby and sapphire, and in many other technical processes.

In the manufacture of electric lamp filaments hydrogen finds further employment. Large quantities are used in the reduction of tungstic acid and in the sintering and fusing of the tungsten metal powder into rods.

Hydrogen produced by the silicon, aluminum and other similar processes costs from $5.20 to $6.85 per 1000 cubic feet. These processes have been displaced by practically three patented processes known as the contact-process (iron process), Rinker-Wolther process (oil process), and the Linde-Frank-Caro process (water gas process). The cost per 1000 cubic feet varies from 54 to 61 cents in these three processes. These figures are given on the basis of prices ruling in Germany. In plants of similar construction in the United States the cost of production is between 85 cents and $1 per 1000 cubic feet. In the United States only four plants of the newer type have so far been installed: two plants of 3530 cubic feet per hour, one of 10,600 cubic feet per hour, and one of 8000 cubic feet per hour. Over fifty electrolytic hydrogen plants have been installed in the United

States in the past five years, and the total amount of hydrogen now being generated by all processes per year in the United States is over 300,000,000 cubic feet.

The number of mechanical and chemical plants of the improved type erected in Europe up to the summer of 1914 (that is, up to the time when the war broke out) was 23, of a total capacity of 3530 to 10,600 cubic feet per hour. Three of these installations produce 200 to 880 cubic feet per hour. All of these plants in Germany, Russia, Austria, Sweden, Holland, Italy and England were installed by Germans. Other large installations were negotiated for, but the writer is unable to ascertain facts regarding them due to conditions at present in Europe. No doubt Germany has increased its hydrogen-producing plants; likewise England, France and the other countries. New installations were undoubtedly required for the increased number of airships and observation balloons which have been built during the war.

MODERN PROCESSES OF THE TECHNICAL PRODUCTION OF HYDROGEN.

Linde-Frank-Caro Process—A Physical Liquefaction Water Gas Process.

In this process water gas, consisting almost solely of carbonic oxide (CO) and hydrogen, is cooled and compressed until the carbonic oxide is liquefied, while the hydrogen still remains gaseous and can be drawn off. The apparatus consists essentially of a water gas plant and a plant for the separation of the hydrogen from the carbonic oxide gas.

The water gas is produced in the usual way by passing steam through incandescent coke, whereby the steam is decomposed, its oxygen forming carbonic oxide with the carbon of the coke, while its hydrogen remains free. Water gas, on the average, consists of hydrogen 50 per cent., carbonic oxide 40 per cent., carbonic acid 4 per cent., nitrogen 5.5 per cent., methane 0.5 per cent., with smaller proportions of oxygen, sulphuretted hydrogen, and carbon bisulphide.

The hydrogen is separated from the rest of the gases by compression and cooling. The boiling-point of hydrogen, –253° C., is much lower than that of the other constituents, that of carbonic oxide being –192° C., and that of nitrogen –192° C. On cooling compressed water gas to the hydrogen are liquefied air, –193° C., all of the constituents except the hydrogen are liquefied. The hydrogen thus easily separated in the gaseous state is of a high degree of purity.

Before this separation by cooling is attempted the water gas undergoes preliminary treatment for the extraction of carbonic acid, which, if not removed, would block the narrow tubes of the rectifying apparatus. The removal of the carbonic acid gas is effected for the most part by compressing the water gas, in contact with cold water, up to a pressure of about 12 atmospheres. At high pressure water absorbs carbonic acid more easily than at atmospheric pressure, and hence the quantity of water required for absorption is reduced. The small residue of carbonic acid still remaining in the water gas is extracted by passing the latter through caustic soda.

This method of compressing water gas and cooling it by liquid air produces hydrogen 97 to 98 per cent. pure. The residue consists of about 1 per cent. each of carbonic oxide and nitrogen. Sulphur, dust and moisture are absent from the gas. The hydrogen leaves the apparatus under a pressure of 25 atmospheres, which is a considerable saving of power when cylinders have to be filled with gas under pressure. Two to four men can operate a plant, depending on its size. The plant is kept in continuous operation for about a week; it is then advisable to shut down the hydrogen separating section in order that all the worn tubes may be cleaned. A second unit of this section of the plant is kept in reserve for use while the first unit is being cleaned. To bring the entire plant into operation requires twenty to twenty-four hours.

The Contact Process—Known as the Lane or Iron and Steam Process.

This process depends upon the well-known property possessed by incandescent iron of decomposing steam which is passed over it. The oxygen of the steam combines with the iron and the hydrogen is liberated. In the practical working of the process reduced iron ore is used which has the advantage over ordinary metallic iron of having a larger active surface and caking or fluxing less readily when heated.

The manufacture of hydrogen by this process proceeds in alternating periods, in one of which oxidized iron is converted by a cheap reducing gas to spongy iron, and in the other period steam is passed over the spongy iron with liberation of hydrogen. The cycle of operations proceeds continuously.

The essentials for the process are, therefore, iron ore, reducing gas and steam. Water gas is used as the reducing gas, and thus the plant required consists of a water gas installation and a special hydrogen apparatus.

The decomposition of the steam by the incandescent iron is effected in vertical iron retorts set in furnaces heated by producer gas. The resorts are charged with iron ore through the upper lids. Above the retorts are valves for regulating the passage through the retorts of steam and of reducing gas alternately and for taking off the hydrogen and the spent reducing gases. The latter, consisting chiefly of carbonic acid and steam, are either discharged into the open, through a shaft, or are passed in to the retort furnaces, where any unconsumed constituents are utilized in heating the retorts.

The hydrogen gas thus produced passes from the retorts to the purifying plant. The first section of the latter is a condenser packed with coke sprinkled with water. From this condenser the hydrogen goes into two purifying vessels, worked in series, for the extraction of sulphur and carbonic acid. The gas then passes to a gas-holder, from which it can be taken either for immediate use or to a compressing station, where it is filled into cylinders. The hydrogen finally obtained by this process has a specific gravity of 0.090 – 0.092; its purity is 97 to 98 per cent., the residue consisting of nitrogen, with 0.2 to 0.3 per cent. carbonic oxide; furthermore, since the gas was cooled by contact with water, it is saturated with water vapor.

A plant for producing 3500 cubic feet per hour requires four workmen for each shift. Skilled labor is not essential. The iron ore which is used in the process can be kept in the retorts in uninterrupted operation for about two or three months. For efficient service the plant must be worked continuously, since it requires fourteen to twenty-four hours to start up from the cold.

The Rinker-Wolter Process—A Chemical Process for the Decarburation of Oil.

This process is the result of a research which originally aimed at the production of an illuminating gas, but failing in this, a highly efficient hydrogen-producing process was developed which ranks in importance with the iron-steam and the contact process. It is this process which is now being used to a great extent by Germany and Russia in their aeronautical work, owing to the portability of the apparatus. Complete installations are set up on railway cars and carried from point to point as required. The plant takes up but little space, and is more easily supervised than the two other processes described above.

The process is one in which gas oil is used which is heated to 1200° to 1400° C. and decomposed into its chief constituents, carbon and hydrogen. The plant comprises the special gas-making plant and purifiers. The gas-making plant consists of two producers which are charged with coke. There is a gas connection from the lower part of the first to the upper part of the second producer; near the furnace and clinkering doors of the producers are air inlets. These air inlets are fitted with valves having interlocking gears to prevent accidents arising from careless manipulation. The air required to raise the heat in the producers is forced through these inlets by a high-pressure blower.

When the producers have reached the requisite temperature, the blower is stopped and the blast valves closed. Oil is then pumped onto the coke in the first producer, through spraying nozzles which atomize it. It is converted into vapor by the hot coke and passes through the bed of hot coke in the second producer. In this way the vapor is converted into a permanent gas, which leaves the bottom of the second producer and enters an hydraulic main. When the air is in turn again blown in at the base of the producers in order to raise their temperature, the carbonaceous residue left by the oil on the coke is burnt and contributes towards the heating up of the producers. It requires one to one and a half minutes' blast to raise the producers to the proper temperature again. Thereupon oil is again introduced into the first producer.

The oil is preheated in order to render it sufficiently thin and mobile to pass through the spraying nozzle. For preheating the oil the exhaust steam from the turbine or engine used for driving the blower is utilized. Solid impurities are removed from the oil by pumping it from the storage tank through a filtering chamber.

The gas issuing from the second producer passes through a water seal in the hydraulic main, and there deposits the greater part of the sooty matter which is carried over mechanically. Clean water flows continuously into the hydraulic main, and the sooty water flows off and runs into a settling pit, having partitions which force the water to take a long and tortuous course in order to ensure the deposition of the solid matter.

The last two chambers of the settling pit are packed with coke, which acts as a filter and retains the last traces of impurities, so that the water may be run thence direct into any sewer or river. Soot is the only by-product of this process; the oil contains 80–85 per cent. of carbon, of which the greater part is liberated; only a small proportion of carbon is found in the form of hydrocarbons and carbonic oxide in the crude hydrogen gas. Most of the liberated carbon is retained by the coke in the producers, and is later burnt by the air blast. A small proportion goes forward as soot in the gas, and is deposited in the hydraulic main and washer. The soot which collects in the settling pit when dried can be burnt under the boiler. The gas passes from the hydraulic main into a washer, where sprays of water remove the last traces of soot.

On leaving the washer the gas contains 6 to 8 per cent. of carbonic oxide and sulphuretted hydrogen. The latter is removed in a purifier charged with bog iron ore. The carbonic oxide is extracted by hot soda-lime in the following manner: The gas passes from the iron oxide purifier into thin-walled retorts, set in a furnace which keeps the soda-lime with which the resorts are charged at a temperature of about 300° C. At this temperature the soda-lime absorbs the carbonic oxide from the gas. The gas thus purified is cooled by passage through an atmospheric condenser and is then stored in a gas-holder. The purity of the gas is from 97 to 98 per cent., the residue being nitrogen. The specific gravity is 0.087 to 0.090.

The operation of the plant is not difficult, and requires only moderate supervision. The producers can be heated up for use in one to two hours, and can be operated continuously for a few hours at a time, or for days, weeks or even months.

An installation of this type may be either stationary or portable. The layout of a portable installation of this process, as now used by the governments of Germany and Russia, is as follows: The producers, with oil tank, oil pump, pre-heater and hydraulic main, are installed on one railway truck, and the purifying plant, including the washer and the final condenser, is arranged on a second truck. A gas-holder constructed of balloon-fabric is carried on a third truck. The gas then passes from this holder to a compressor, placed on a fourth truck, by which it is compressed into steel cylinders.

Production of Hydrogen by Electrolysis.

In this process water is decomposed into its constituent elements, oxygen and hydrogen, by the aid of the electric current. One of the first commercial plants of this type to be erected in the United States was at Waverly, Newark, N. J., in 1911. The electrolytic generators, or cells, are of two types; the unit type is composed of an outer tank, which serves as the negative electrode, and a perforated inner tank made of special composition iron which serves as the positive electrode. The two electrodes are separated by means of a specially prepared asbestos diaphragm which divides the apparatus into two compartments. On top of the cover are the current terminals, two sight feed indicators and pressure equalizers, also a cup through which water is introduced into the cell from time to time.

As soon as the electric current is applied oxygen and hydrogen are seen to bubble through the indicators. The electrolyte is an aqueous solution of caustic potash or soda, which serves to make the water a good electrical conductor. In each cell about 1 gallon of water is decomposed per 24-hour day, producing 76.8 cubic feet of oxygen and 153.6 cubic feet of hydrogen. The hydrogen is liberated on the walls of the outer tank (negative electrode), while the oxygen forms on the walls of the inner tank (positive electrode). The oxygen is carried up through suitable means to the oxygen equalizer, where it bubbles through water and passes on to the oxygen off-take pipe; the hydrogen similarly passes through the hydrogen equalizer and thence to the hydrogen off-take pipe. Each cell produces per kilowatt hour, 8 cubic feet of hydrogen and 4 cubic feet of oxygen. The current required per cell is 400 ampères at 2 volts. The purity of the electrolytic hydrogen is 99.8 per cent. and the oxygen 99.6 per cent.

The cost of hydrogen by this process, disregarding the value of the evolved oxygen, is about ⅛ of a cent per cubic foot at a current cost of 1 cent per kilowatt-hour at the generator. For small or moderate size plants where low cost current is available the electrolytic process is preferable to any other for the production of hydrogen.

The attractive features of this process are: (1) the simplicity of operation; (2) the little attention required (not exceeding the cost of a few hours of one man's time per day); (3) cheap raw material (requires only 1 gallon of water to be added to each cell per day). The plant can be operated continuously for years without cleaning or overhauling; the process is clean and safe, and the cell produces gas as soon as the current is turned on.

Another variation of the unit type generator or cell is the bipolar generator recently placed upon the market.[2] This type of generator is of the filter press type, but is not a modified filter press. While the form of this generator was early introduced in the art the bipolar type only resembles same in form. It is specifically designed for the electrolytic separation of water at the highest efficiency. This type of generator is to be commended where floor space is a consideration, as it is more compact than the unit type cell. The bipolar generator is made in two sizes. The 4 × 11 feet has a rated daily capacity of 1700 cubic feet of hydrogen and 850 cubic feet of oxygen. Size 5 × 15 feet has a rated 24-hour capacity of 7000 cubic feet of hydrogen and 3500 cubic feet of oxygen. The above capacities are based on the use of caustic potash as electrolyte. Purity of the hydrogen is 99.8 per cent. and oxygen 99.6 per cent. The generator may be operated twenty-four hours a day and 365 days in the year. The cost of the gases produced is about the same as in the unit type. The bipolar generator is as completely automatic as a high duty generator of this type can be made. Practically the only attention required in operation is in the maintenance of the water supply. Only part of one man's time is necessary.

HYDROGEN IN THE INDUSTRIES.

Hydrogen Employment in Quartz Glass.

Quartz glass, which has long been recognized as an important material in the manufacture of various articles employed in the chemical industry, was first produced in 1839 by Professor Gaudin. Some of his quartz tubes and elastic threads were exhibited at the Paris Exposition in 1878.

In 1889, Boys, who recognized the possibilities of this remarkable substance, also succeeded in making small tubes and other articles.

However, little progress was made in the development of the quartz-glass industry until 1900, when Heraeus and Achendstone succeeded in making clear rock crystal articles large enough for practical purposes. The raw material is washed quartz sand containing 95 per cent. silicic acid, which is melted by the oxy-hydrogen flames, and it is now possible to melt and to mold into almost any desired form as much as 50 pounds of quartz at a time.

One of the remarkable properties of the quartz glass produced by this process is its resistance to acids. Even boiling acids, with the exception of hydrofluoric and phosphoric, will not readily affect it.

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[2] See *Metallurgical and Chemical Engineering*, vol. 14, p. 108.

Quartz has the advantage of having a very low coefficient of expansion, being about $^1/_{17}$ that of the best glass suitable for chemical utensils and apparatus. The manufacture of quartz glass in the United States is only of very recent date.

Hydrogen in Balloons and Dirigible Airships.

Hydrogen, on account of its very low density, has the greatest lifting power of all gases, and is therefore used for filling balloons. The amount which a balloon will carry up, *i.e.,* "its ascensional power," is the difference between the weight of the balloon itself with its contained hydrogen, and that of an equal volume of air. A litre of hydrogen gas has an ascensional force of 1.2 grammes. The specific gravity of 98 per cent. hydrogen is 0.087, which corresponds to a lifting power of 73.5 pounds per 1000 cubic feet. Pure hydrogen has a specific gravity of 0.07, which corresponds to a lifting power of 75 pounds per 1000 cubic feet.

Hydrogen for balloon purposes must be free from impurities that would injure the fabric, and should be dry. It is not necessary that the hydrogen be under pressure for inflating a balloon. It will readily inflate at atmospheric pressure.

Melting of Platinum.

In the melting of platinum the oxy-hydrogen burner is used exclusively. The temperature of the oxy-hydrogen is about 2100° C., whereas the melting point of platinum is 1755° C. The great advantage of this flame is that it contains no elements injurious to the platinum, such as carbon. Illuminating gas, which was formerly used instead of hydrogen, was detrimental to platinum. The operation is carried out by passing oxygen and hydrogen at high pressure through an especially constructed oxy-hydrogen torch. The author devised a torch for this work several years ago, and it is practically the only platinum melting torch (oxy-hydrogen) used to-day in the United States by platinum smelters. The melting is best accomplished in a lime crucible. Oxygen and hydrogen at a pressure of 1800 pounds per square inch in cylinders containing 100 and 200 cubic feet, with reducing valves and regulators, are used.

Production of the Synthetic Ruby and Sapphire.

Practically all of the beautiful minerals of the corundum family are now being produced synthetically. The ruby and sapphire are the more important.

Alumina being the base of those precious stones, it remains only for the chemist to add the proper oxide to obtain the required colors and to fuse them together in the oxy-hydrogen flame. The ruby, for example, contains 98 per cent. of pure alumina and about 2 per cent. of chromic oxide.

The materials used are of the purest. It is absolutely essential that the material be pure, as otherwise the product obtained will be faulty and the color will be poor.

At a temperature of 1000° C. the material is calcined in a large oven and removed and reduced to a fine powder. The fine powder is then placed in the magazine of the oxy-hydrogen burner and forced down on a receiving base below the flame. The work at this stage is very delicate and requires most careful attention. All conditions must be regulated with mathematical precision, the rate of flow of the Al_2O_3 powder, the rate and pressure of the gases and the quality of the flame (1900° C.). With conditions properly adjusted the stone at first appears as a little stalk not larger than a pin head, which gradually grows in the fire. This stalk, as it grows taller, is broadened out by the manipulation of the torch by a skilled operator so as to form a small cone with the point down. The desired size obtained, the operator shuts off the gases and allows the jewel to cool. It is then broken from the base and is ready for cutting.

Electrolytic oxygen and hydrogen are used exclusively in this industry on account of the exceedingly high degree of purity of the electrolytic gases.

Hydrogenation of Oils.

In connection with the fat industry a very extensive use for hydrogen has developed. By the introduction of hydrogen into fatty bodies and oils of low melting point these are converted into hard fats of higher melting point. In other words, oils which are composed of unsaturated acids, such as oleic acid and their esters, will combine with hydrogen in the presence of a suitable catalytic agent, forming a saturated compound:

$$C_{17}H_{33}COOH + H_2 \rightarrow C_{17}H_{35}COOH$$

$$\text{oleic acid} + \text{hydrogen} = \text{stearic acid.}$$

The hard fats have a greater market value for the manufacturer of soap, candles and oleomargarine. Fish oils,, etc., lose their disagreeable odor in the hardening process. The application of hydrogen in the fat industry has brought about a great advancement. The process worked out on the following lines is known as hydrogenation.

The addition of the hydrogen to the unsaturated hydrocarbon of the soft fats is accomplished by exposing the latter to hydrogen under pressure at high temperature in the presence of a contact agent such as a mixture of finely divided clay with metallic nickel, copper or iron. This mixture is sprayed into a container made of boiler plate under a pressure of 4 or more atmospheres, the pressure varying according to the method of working and the catalytic agent employed. Into the container from the opposite end is introduced a current of hydrogen, which at a temperature of about 150° C. readily combines with the oil or reduces the fatty acids. The hydrogen is added in excess in order to facilitate the conversion, but the surplus hydrogen, after being freed from oil particles, is returned to the storage tank.

The consumption of hydrogen varies according to the nature of the raw material and the hardness of the product. It is usually from 2870 to 4300 cubic feet per ton. The fatty product run-off from the pressure vessel is an emulsion of the fat with the contact substance. The latter, after separation by centrifuging, is used over again.

The contact substance, according to the patent of Leprince and Siececke (Dr. Norman) is finely divided nickel or copper; according to Fokin, it is platinum, and according to Paal, palladium. With the last two conversion is effected at ordinary or relatively low temperature and at an exceedingly low pressure. Wherever these two rare metals in suitable form are used, many improvements in the process have lately been introduced. It is absolutely necessary to use hydrogen of a high degree of purity, since slight impurities in the gas will render the contact substance inactive. In the hydrogenation of cotton seed oil, 1 per cent. of hydrogen by weight converts it into a fatty body of the consistency of lard. The product obtained is edible.

The Synthetic Production of Ammonia.

The discovery of the synthetic production of ammonia by Professor Haber, of Karlsruhe, a few years ago, promises a very extensive use for hydrogen. It is of immense importance because it forms the basis of the well-known fertilizer, sulphate ammonia. When hydrogen and nitrogen are heated to 200° C. in their combining proportions, under high pressure and in the presence of uranium as a contact substance, they unite to form ammonia. About 6 per cent. of ammonia is produced, and by removing this a further conversion is effected. The yield can undoubtedly be greatly increased and the process accelerated by the selection of a possibly more suitable contact substance and the application of possibly more appropriate temperature and pressure.

BOOK REVIEWS.

The Microscopy of Vegetable Foods. With Special Reference to the Detection of Adulteration and the Diagnosis of Mixtures. By Andrew L. Winton, Ph.D., Formerly Chief of the United States Food and Drug Laboratory of Chicago. With the collaboration of Dr. Josef Moeller, head of the Pharmacognostical Institute of the University of Vienna, and Kate Barber Winton, Ph.D., formerly micro-analyst, United States Bureau of Chemistry. With 635 Illustrations. Second edition. New York: John Wiley and Sons, Inc.

The first edition of this work in 1906 was indeed welcome to micro-analysts in the United States. Those having charge of the examination of foods and food products are usually quite conversant with chemical methods, but, as a rule, are untrained in microscopical work. Outside of the instruction given in colleges of pharmacy there is very little special microscopical training given to analysts. The result is a large corps of partially trained analysts who cannot avail themselves of what the microscope might reveal in the examination of industrial products. Perhaps one of the stumbling-blocks to directors having charge of chemical courses is the fact that most of the books, dealing with microscopical study of technical products, show that a great amount of preparation and considerable skill are necessary in order that results may be obtained. It is considered self-evident in a university course that a student must devote a semester to crystallography and another semester to mineralogy before he can proceed intelligently and satisfactorily take up physical crystallography. On the other hand, when it comes to microscopical work he is expected to have about as much training as he does with the polariscope and refractometer. It is self-evident that in the microscopical study of technical products considerable time should be devoted to acquiring certain botanical principles and biological methods in order that microscopical studies of raw or manufactured products shall yield far-reaching results. This work of Winton might well be used in all university courses where chemists are turned out. No part of their curriculum would train them better or stimulate them more than the studies outlined in this work. It, however, has been prepared rather with a view of assisting in the detection of adulterations and in the diagnosis of mixtures. It is a practical manual for the analyst to use in his laboratory. The authors have not only done a great amount of original work themselves, but have had a large experience in state and federal work.

" Since the publication of the first edition of this book, microscopical methods have come into more general use throughout the United States in the examination of human and cattle foods, and, as a consequence, certain fraudulent practices have been suppressed or much restricted."

" Additions have been made to the sections on wheat and flour, a complete revision of such parts of the chapter on oil seeds as treat on mustards, rapes, cruciferous weed seeds, and linseed, a description of the histology of alfalfa, with distinctions from red and alsike clover, a revision of the sections on pomes and drupes, with practical hints on the examination of almond pastes, jams, preserves, and other fruit products, and rewritten descriptions of the cucurbitaceous fruits used as foods and adulterants."

" The application of the microscopy of foods is by no means limited to the detection of adulteration and the identification of unknown materials. The miller, the brewer, the oil presser, the feed manufacturer, the canner, and the coffee and spice grinder should be conversant with the structure as well as the chemical composition of their raw materials, and the student in the school of technology should follow both lines of study in order that he may be prepared to attack the complicated problems of the industries."

This work consists of ten parts, as follows:

Part I. Preliminary: Equipment, Methods, and General Principles.

Part II. Grain: Its Products and Impurities: Flour and Meal: Cereals: Weed Seeds: Fungus Impurities.

Part III. Oil Seeds and Oil Cakes: Cruciferous Seeds (Cruciferæ) : Composite Oil Fruits (Compositæ) : Miscellaneous Oil Seeds.

Part IV. Legumes.

Part V. Nuts: Palm Fruits (Palmæ) : Walnuts (Juglandaceæ) : Cup Nuts (Cupuliferæ) : Miscellaneous Nuts.

Part VI. Fruit: Rosaceous Fruits (Rosaceæ): Saxifragaceous Fruits (Saxifragaceæ): Ericaceous Fruits (Ericaceæ): Citrus Fruits (Rutaceæ): Miscellaneous Fruits.

Part VII. Vegetables: Solanaceous Fruits (Solanaceæ): Tubers and Roots: Fungi.

Part VIII. Alkaloidal Products and Their Substitutes.

Part IX. Spices and Condiments: Rhizomes: Leaves: Flowers.

Part X. Commercial Starches.

It also contains a General Bibliography and a Glossary. Each article is handled with a detailed description of its microscopical structure, and this is usually supplemented with very beautiful and accurate drawings. There are also appended the principal diagnostic elements and a bibliography of important original papers. Where there are a number of related substances there is usually an analytical key which is helpful in practice.

The first edition has been very widely used and there are few laboratories or libraries in which it will not be found. The reviewer has used the first edition in his classes ever since it was issued, and has found it of great help to him and his students. The new edition, with the inclusion of the latest researches, will be greatly appreciated by microscopical analysts and students of the inner morphology of plants.

H. K.

PLANT ANATOMY FROM THE STANDPOINT OF THE DEVELOPMENT AND FUNCTIONS OF THE TISSUES AND HANDBOOK OF MICRO-TECHNIC. By William Chase Stevens, Professor of Botany in the University of Kansas. Third edition, revised and enlarged, with 155 illustrations. Price, $2.50 net. P. Blakiston's Son & Co., Philadelphia, Pa.

This work of Professor Stevens is one of the most popular in the United States. For clearness of presentation of the subject and wealth of illustrative material on plant anatomy it is excellent. In this third edition there has been added a section on the phylogeny of the vascular bundle, and notable additions and improvements have been made to the chapters on reagents and processes and microchemistry of plant products.

The work includes chapters on: The Plant Cell; Differentiation of the Tissues; Secondary Increase in Thickness; Protection from Injuries and Loss of Water; The Plant Skeleton; The Absorption of Water and Minerals; Transport of Water and Soil Solutes; Intake and Distribution of Gases; Construction of the Plant's Food;

Transport of Foods Throughout the Plant; Storage of Food and Water; Secretion and Excretion; Reproduction; The Preparation of Sections; The Use of the Microscope; Reagents and Processes; Micro-chemistry of Plant Products; Detection of Adulterations in Foods and Drugs; and the work also includes a satisfactory index.

In his preface to the third edition the author calls attention to the growing interest in plant anatomy, and states that plant anatomy without the physiological and phylogenetic outlook is a soulless body, and that physiology lacking an anatomical basis possesses the evasiveness of a disembodied spirit. He believes that it is largely due to this change of viewpoint that accounts for the present-day interest in plant anatomy. While this may be true to some extent, the reviewer considers that it is in great part due to the very great practical interest in the subject. No phase of botanical work is complete unless accompanied with anatomical studies. This is even true in taxonomy, where it is used more than ever and is vitalizing the subject. H. K.

CURRENT LITERATURE.

On the Presence of Histidine-like Substances in the Pituitary Gland (Posterior Lobe).

Kossel gave the name histidine to a basic compound which he found among the cleavage products of sturine. This was in 1896. Subsequently this same compound was found among the cleavage products of complex proteins when these were subjected to acid hydrolysis or to tryptic digestion. Pauly found that a solution of histidine made alkaline with sodium carbonate gives a very beautiful diazo-reaction with diazobenzene sulfonic acid, which is deep cherry-red in dilutions of 1 : 20,000 and still markedly red in 1 : 100,000. Working with this solution and noting its behavior with the desiccated posterior lobe of the pituitary gland (consisting for the greater part of protein) prepared in the usual way, and a purified product soluble in water, the author of this paper draws the following conclusions:

1. It would seem that histidine (or some such compound or compounds) is contained in the desiccated posterior lobe of the pituitary gland.
2. These substances are probably in a more or less free state, or in some combination other than protein.

3. The compounds giving Pauly's reaction are probably not histidine, since Weidel's reaction, as modified by Fisher, and Knoop's reaction with bromine, were both negative.

4. Pauly's reaction is not a specific reaction for histidine, unless other compounds, such as tyrosine, *p*-oxyphenylethylamine, *B*-iminazolylethylamine, adrenalin, etc., are removed, but a general reaction for a class of compounds yet to be determined. (*Jour Amer. Chem. Society,* Jan., 1915, pp. 203–208, T. A. Aldrich.)

J. K. T.

ORIGIN OF THE BUTTERMILK CULT.[1]

Many signs point to the existence of a buttermilk cult, a more sensible practice than most of those things which are called cults and fashions. No dairy lunch seems now to be able to do business without the aid of buttermilk, and it is being served in drug stores and in barrooms. Though the virtues and palatability of buttermilk have been known for ages, it is now being honored with the appreciation of more patrons than ever before. The buttermilk renaissance set in when the statement gained wide currency that sour milk was an aid to longevity. No doubt a great many persons were led to tasting buttermilk through reasons of vanity, but finding it good have got the habit. Every now and then there is a statement from some man of medicine that certain poisonous germs in our stomachs are destroyed by buttermilk and that perhaps the human family would be better off if it drank more buttermilk and sweet milk and less of many other beverages recommended as thirst quenchers.

It has been written that from immemorial days curdled milk in various forms has not only been a favorite article of diet among pastoral peoples, but has been credited with medicinal properties. Sour milk figured conspicuously in the Aryan system of medicine, and medical historians saw that that system antedated by centuries the theories and practices of Hippocrates, and by some writers it is maintained that Hippocrates acquired much of his medical wisdom either in the land of the Aryans or from members of that great division of the human family.

Milk was known to possess remarkable therapeutic properties, and it was prescribed fresh and in the form of curds and whey. It was highly recommended by ancient physicians in the case of intestinal disorders, and somewhat different remedial qualities were ascribed to the milk of the cow, buffalo, goat, sheep, elephant, ass, and camel.

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[1] From the *Washington Star.*

Pasteur made researches into the nature of fermentation, and it is said that the facts which he observed laid the foundation of biochemistry and bacteriology. He established what was then new, but what is now universally admitted, that in the matter of sour milk the chemical changes were effected by microörganisms, which cause the souring of milk by converting lactose or milk sugar into lactic acid, and produce analogous changes in other sugar-containing fluids.

What has come to be called the lactic acid theory was a step toward combating harmful bacteria with bacteria which in themselves were harmless and which were the natural enemies of the harmful bacteria.

Professor Metchnikoff, observing the high number of cases of long life among the peasantry of Bulgaria, made an investigation into their habits of living and, of course, among other things, found that they led a simple life and that an important article of their diet was curdled milk. In making a careful bacteriological analysis of this food three acid-forming organisms were isolated and one of these, established to be the most active of the three, was named *Bacillus bulgaricus.* Of this organism it has been written that it acted in counteracting the putrefactive changes set up in food products by other bacteria inhabiting the intestines. This result or decision was reached at the Pasteur Institute in Paris. The theory was reached that acid-forming organisms have the property of arresting the growth and activity of putrefactive alkaline ones, which cause a secondary fermentation with the production of poisonous changes, especially in the large intestine, and are absorbed.

The cleansing quality of sour milk is quite generally believed, and there has come to be a very large demand for buttermilk. It is worth noting that the buttermilk of commerce, the kind that a man gets when he walks up to a counter, is not " buttermilk," but " ' butterless ' milk," or skimmed milk which has been turned sour after the butterfat has been removed by a separator.

In the old days in the country, and to some extent in the country to-day, when the housewife or the maid churned butter not every bit of butterfat was removed. A good deal remained in the sour milk, and it was really buttermilk. Very little buttermilk of that kind is to be met with to-day, except in those families which still churn butter in the old way.

TARANTISM AND THE DANCING MANIA.[1]

Some people, in an effort to explain the modern dancing craze, have attempted to liken it to the remarkable dancing mania of the Middle Ages. Whether this is true or not, it is interesting to recall to mind the extensive outbreak of frenzied dancing which swept over a great part of Europe, particularly during and immediately after the tremendous epidemics of the Black Death. One of the earliest outbreaks to be completely described occurred in Aix-la-Chapelle, in 1374. The following strange spectacle was noted: Men and women "formed circles hand in hand, and, appearing to have lost control of their senses, continued dancing, regardless of the bystanders, for hours together in wild delirium, until at length they fell on the ground in a state of exhaustion. During the paroxysms the victims had hallucinations and some asserted that they felt that they had been immersed in a stream of blood, which obliged them to leap so high."

This extraordinary disease rapidly spread to many parts of Belgium, Holland, and Germany, where it was variously known as St. John's or St. Vitus' dance, according to the saint who was supposed to protect those afflicted. The malady was first considered the work of the devil, and the clergy were kept busy in their efforts to exorcise the evil one. That the disease was contagious was obvious, and the victims were prone to acute recurrences.

In Italy, where the disease later appeared, the learned Nicholas Perotti, in an account of the disorder, points out that no one had the least doubt that it was caused by the bite of the tarantula, a common ground spider, particularly plentiful in Apulia, a southern district in Italy. It is significant to note this early attempt to explain the malady on natural lines and subordinate the supernatural. From the insect the disease was given the name of *tarantism*. There was a general conviction that by music and dancing the poison of the tarantula was distributed throughout the whole body, and expelled in the sweat induced by the great exercise. Later on it became evident that even those who were not bitten contracted the disease. Inquisitive persons who came to see the unfortunates in their wild dances not infrequently stayed to participate. Relief could only be obtained by dancing until complete exhaustion was produced. The musicians, who in some instances were employed by the municipality for this special purpose, were under no circumstances allowed to stop, and substitutes had to be employed to relieve musicians who were themselves literally played out. As time went on it was noted that special kinds of music were very effective in bringing about the speediest cures. Music which permitted quick, lively dancing was most efficacious. A rapid music imported from Turkey soon became the standby and was given the name of tarantella, a term still used to describe a rapid whirling dance. There is an illustration in Athanasius Kircher's *Magnes sive de Arte Magnetica* (1643) which shows the tarantula, a map of that portion of Italy first affected, and a few stanzas of music labelled *Antidotum Tarantulæ.*

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[1] *Science Conspectus*, vol. vii. 1916, p. 56.

Tarantism was at its greatest height in Italy in the seventeenth century, long after the disease had disappeared in Germany. From this time the disease decreased, but has appeared on occasion among special sects, as for example the Convulsionnaires in France, the Holy Jumpers and the Barkers in England, the Holy Rollers in the United States.

Space prohibits a discussion of the disease itself, suffice to say that it is definitely known to be a nervous disorder akin to an imitative hysteria. It is doubtful if we shall ever see such widespread affections, but we may expect occasional outbursts of a similar character in connection with fervent revival services and the like. The poor physical and mental condition of the people in the past produced through poverty, plague, and other disasters undoubtedly played no small part in preparing their minds for the disorder of the Dancing Mania.

S. M. G.

Diabetic Foods.

Food Inspection Decision No. 160, recently issued by the United States Department of Agriculture, for the guidance of officials of the Department in enforcing the Food and Drugs Act, fixes a definite limit to the amount of starch and sugar that may be present in certain gluten products and diabetic foods, and also fixes the amount of nitrogen that must be present in certain of these products, and makes requirements as to moisture and other constituents. The decision covers ground gluten, gluten flour, self-raising gluten flour, and "diabetic" foods. The definitions and standards as stated in the Food Inspection Decision were recommended by the Joint Committee on Definitions and Standards, consisting of representatives of the

United States Department of Agriculture, the Association of American Dairy, Food, and Drug Officials, and the Association of Official Agricultural Chemists. These two associations have already adopted the definitions and standards.

Investigations by the officials in charge of the enforcement of the Food and Drugs Act have shown that various food products have been placed on the market from time to time that are recommended by the manufacturers for use by people suffering from diabetes. It is generally held that the foods best suited to persons suffering from diabetes are those which contain little or no starch and sugar. Some of the foods placed on the market and recommended by the manufacturers for use in diabetes have been found to contain nearly as much starch and sugar as ordinary products, so that they were of no more value in the treatment of diabetes than ordinary food products that could be purchased more cheaply. The diabetic patient can avoid ordinary food products that contain considerable quantities of starch and sugar, as the composition of these products are generally known. In the case of prepared foods advertised for use in diabetes, however, the patient may be misled into eating quantities of starch and sugar that might be positively injurious.

Hereafter such products should meet the requirements of Food Inspection Decision No. 160, which are as follows:

Ground gluten is the clean, sound product made from wheat flour by the almost complete removal of starch, and contains not more than ten per cent. of moisture, and, calculated on the water-free basis, not less than fourteen and two-tenths per cent. of nitrogen, not more than fifteen per cent. of nitrogen-free extract (using the protein factor 5.7), and not more than five and five-tenths per cent. of starch (as determined by the diastase method).

Gluten flour is the clean, sound product made from wheat flour by the removal of a large part of the starch, and contains not more than ten per cent. of moisture, and, calculated on the water-free basis, not less than seven and one-tenth per cent. of nitrogen, not more than fifty-six per cent. of nitrogen-free extract (using the protein factor 5 7), and not more than forty-four per cent. of starch (as determined by the diastase method).

Gluten flour, self-raising, is a gluten flour containing not more than ten per cent. of moisture, and leavening agents with or without salt.

"*Diabetic" Food.*—Although most foods may be suitable under certain conditions for the use of persons suffering from diabetes, the term "diabetic" as applied to food indicates a considerable lessening of the carbohydrates found in ordinary products of the same class, and this belief is fostered by many manufacturers on their labels and in their advertising literature.

A "diabetic" food contains not more than half as much glycogenic carbohydrates as the normal food of the same class. Any statement on the label which gives the impression that any single food in unlimited quantity is suitable for the diabetic patient is false and misleading.

The foregoing definitions and standards are adopted as a guide for the officials of the United States Department of Agriculture in enforcing the Food and Drugs Act.

TARTRAZINE AS A FOOD COLOR.

A Food Inspection Decision has been issued by the United States Department of Agriculture permitting the use of tartrazine in coloring food products. Investigations have shown this color to be harmless and suitable for coloring foods. It is manufactured in large quantities in the United States. Seven other coal-tar dyes have been permitted in foods since the enactment of the Food and Drugs Act. Samples of all dyes certified by the manufacturers are examined in the Bureau of Chemistry and only such dyes permitted as are free from impurities and harmful substances.

Another decision has recently been issued making more stringent requirements in reference to the certification of coal-tar dyes when mixed with substances not coal-tar dyes. This decision provides that hereafter the manufacturer shall deposit with the Secretary of Agriculture a declaration that every package in which any such mixture is sold shall have a plain and conspicuous statement of the quantity or proportion of the certified dyes present in the mixture.

DRUGS BELOW STANDARD.

Several Washington druggists have pleaded guilty to the charge of selling adulterated and misbranded tincture of iodine, according to a recent issue of the Service and Regulatory Announcements of the Bureau of Chemistry. Samples of tincture of iodine were purchased under authority of the Secretary of Agriculture from a number of

Washington druggists by inspectors of the Health Department. Analysis of the samples showed that many of them were deficient in some ingredients essential to a full-strength tincture. The Food and Drugs Act provides in substance that, when a drug is sold under a name (such as tincture of iodine) that is recognized in the United States Pharmacopœia, it must conform to the standard of strength, quality, or purity, as determined by the test laid down in the Pharmacopœia, or contain a statement on the label showing its true standard of strength, quality, or purity.

Tincture of iodine is used largely as an antiseptic in surgical operations. It is used also externally for local irritations and inflammations. Failure to prepare a tincture of standard strength is due usually to carelessness. A number of Washington druggists pleaded guilty to the charge of selling adulterated and misbranded tincture of iodine, and were fined $10 each by the court.

SANITARY CONDITION OF BOTTLED WATERS.

The Bureau of Chemistry for several years has been investigating the sanitary conditions in the production and distribution of bottled mineral and table waters which are offered for sale in interstate commerce and therefore subject to the Food and Drugs Act. It is recognized that the sale of bottled waters is dependent largely upon the belief by the public in the purity of the product. The Bureau has recently conferred with a large number of sanitary experts and bacteriologists regarding a desirable standard for judging the sanitary character of bottled waters. As a result of the investigational work and the above-mentioned conferences the Bureau believes that the tolerances established by the Public Health Service of the Treasury Department for waters served on interstate carriers are none too rigid for application to bottled waters sold in interstate commerce or imported from foreign countries. The Treasury Department standards are as follows:

1. The total number of bacteria developing on standard agar plates, incubated 24 hours at 37° C., shall not exceed 100 per cubic centimetre; *Provided,* That the estimate shall be made from not less than two plates, showing such numbers and distribution of colonies as to indicate that the estimate is reliable and accurate.

2. Not more than one out of five 10 c.c. portions of any sample examined shall show (by the method of the Public Health Service) the presence of organisms of the *Bacillus coli* group.

THYMOL FROM HORSEMINT.

That the commercial production in this country of thymol from horsemint may be, under favorable circumstances, a profitable undertaking is indicated by the recent investigations of the United States Department of Agriculture, the results of which are published in Bulletin 372. Thymol is extensively used in medicine, and forms the basis of a number of important pharmaceutical compounds. In the past it has been imported from northern Europe, where it is manufactured from ajowan seed grown in northern India. Now that the European war has reduced these importations from over 18,000 pounds in 1914 to a little more than 2000 in 1915, it is believed that to some extent the demand can be supplied at home. For several years the Department of Agriculture has been conducting experiments with horsemint, which occurs as a common weed in many localities. These experiments have resulted in improving the plants by selection to a point which, it is said, warrants the use of horsemint for the commercial production of thymol.

Horsemint is found wild on light, sandy soils over the entire region from southern New York to Florida and westward to Wisconsin, Kansas, and Texas. It is probable that it will thrive under cultivation wherever it is found growing wild, but local economic conditions must be considered in determining whether or not its production would be profitable. The investigations of the Department of Agriculture indicate that by distilling the improved plants an average of 20 pounds of oil per acre may be obtained from first-year plantings, and that in succeeding years the yields should be at least 30 pounds per acre. The phenol content of this oil may be assumed to be about 70 per cent., almost all of which is thymol. The yield of thymol per acre of horsemint, therefore, should be, for the first year, a little less than 13 pounds, and for succeeding years a little less than 20 pounds. As the average price of thymol for a number of years has been about $2 a pound, the gross returns per acre from a horsemint plantation are estimated in the bulletin already mentioned at about $25.72 for the first year and $38.58 for each succeeding year.

It is more difficult to estimate with accuracy the cost of producing the thymol. In the opinion of the investigators, it is doubtful whether the profits from the industry will be sufficient to warrant any one in engaging in it unless the horsemint is grown in connection with other oil-yielding plants for which a distilling apparatus is required. In that event, of course, the entire cost of the distilling plant cannot be charged against the thymol industry alone. For this reason, in the estimates of cost of production published in Bulletin 372, such items as land rent, taxes, depreciation, upkeep, and interest on the distilling plant have not been included. Excluding these items, it is believed that thymol can be produced at an approximate cost of $23 per acre the first year and $19 per acre thereafter. This figure includes the growing of the plants, fertilizer, cultivation, harvesting, and distilling. A plantation of horsemint will not have to be replanted oftener than once in five years, and under average conditions may continue to give a good yield for a still longer time. After the first year a material reduction can be made in the cost of fertilizers if the distilled herb is returned to the soil. These facts account for the reduction in the cost of production after the first year.

Color-Blindness.

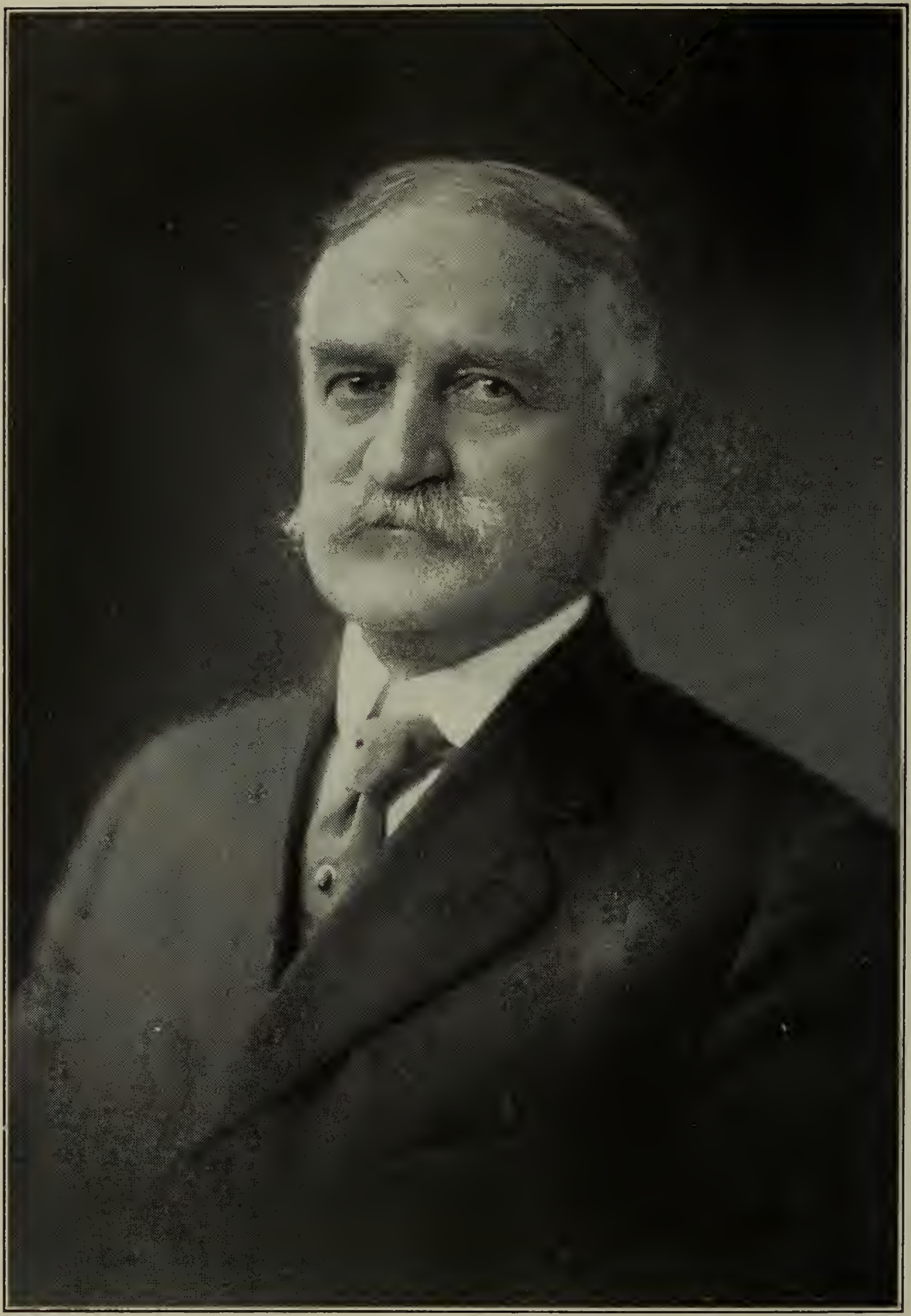
It is only within a hundred years that color-blindness has been known to exist, and it is only comparatively recently that it has been known that women are never color-blind. Color-blindness is a characteristic which is inherited and passes on from one generation to another. If all the children of a color-blind father are girls, the trait remains dormant and reappears in one of every four male children of the next generation. It is, therefore, a sex link characteristic.

There are two types of complete color-bindness, each of which has to do with two groups of colors—red to blue and white and black. When the color-blind man has two important colors affected, he is said to be "dichromatic." When he is only color-blind and sees merely white and black, he is "monochromatic."

In the first of the above divisions are those who are red blind, green blind, and violet blind. Red blindness is most frequent. Its victims are really blind to both green and red, distinguishing only yellows and blues.

The seat of color vision is at the very centre of the retina. If the retina were painted with rings like a target, the bullseye would contain the visual points for green, the next outer ring would be red, the third blue, then white, and the outside ring would be black.

Some persons see colors imperfectly, but do not have true color-blindness. This defect is due to the use of tobacco. There is no known way of curing color-blindness.



PROF. SAMUEL P. SADTLER,

Retiring Professor of Chemistry and Dean of the Department of Special Technical Instruction.

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SAMUEL P. SADTLER, Ph.D., LL.D.

Retiring Professor of Chemistry and Dean of the Department of Special Technical Instruction.

Samuel Philip Sadtler, now emeritus professor of chemistry in the Philadelphia College of Pharmacy, was born at Pine Grove, Schuylkill County, Pa., July 18, 1847. His father, the late Rev. Dr. Benjamin Sadtler, was a Lutheran minister and served, in addition, for a period of ten years as president of Muhlenberg College, at Allentown, Pa. His early education was obtained at Easton, Pa., from the high school of which he graduated during his father's residence at that place, in 1862. The same year he entered Pennsylvania College, at Gettysburg, from which he graduated in 1867, his course having been interrupted during the year of the Battle of Gettysburg, in 1863.

In the fall of 1867 he went to the newly-established Lehigh University to begin his professional studies in chemistry, this choice being largely determined by the fact that his friend, Doctor Mayer, had been called there at that time as professor of physics. A year was spent here in the study of chemistry, physics, and mineralogy, when, having a desire for more extended opportunities, he went, in the fall of 1868, to Harvard University, where he entered the Lawrence Scientific School as an advanced student under Dr. Wolcott Gibbs, then the most distinguished chemist in America. After a year and a half spent here under Professor Gibbs in chemistry and Josiah P. Cooke in mineralogy he passed his examinations for the degree of Bachelor of Science in January, 1870, and a month later sailed for Germany, where he wished to complete his chemical studies.

After a year spent at the University of Göttingen, where he obtained the degree of Doctor of Philosophy in the spring of 1871, and several months in travel, he returned in the summer of the same year to take up his life-work as a teacher of chemistry. From 1871 to 1874 he was professor of chemistry and physics in Pennsylvania College, from which he had graduated in 1867, and in the fall of 1874 he came to Philadelphia as professor of General and Organic Chemistry in the University of Pennsylvania. It was while holding this latter position that, in 1878, he was asked to relieve Prof. Robert Bridges, the venerable professor of chemistry in the Philadelphia College of Pharmacy, by taking part of his lecture work, and when, in the spring of 1879, Doctor Bridges was made emeritus professor of chemistry, Doctor Sadtler was elected as his successor. From that time to the present his interest in pharmacy has had a continuous growth, as is shown by his work as a teacher and his literary activity in that direction. The professorship at the University of Pennsylvania he relinquished in 1891, after seventeen years of service, and opened an office as consulting chemical expert, which he has since maintained.

Professor Sadtler has devoted much attention and study to the modern chemical processes of manufacture and to the field of Industrial Chemistry. He is recognized as one of the most prominent consulting chemists in America, and has been engaged as chemical expert in many of the most important patent suits of the last twenty-five years.

He has made a special study of petroleum and its products, and is widely known and consulted as an authority thereon. He was one of the two experts selected by the Citizens' Municipal Association and the Trades League of Philadelphia to investigate the subject of asphalts for street paving.

Professor Sadtler's first literary work was a "Handbook of Chemical Experimentation for Lecturers and Teachers," published in 1877. He was the American editor of the eighth edition of "Attfield's Chemistry," a text-book especially prepared for students of pharmacy in England and the United States. In 1880 he became associated with Dr. H. C. Wood and Prof. Joseph P. Remington in the revision of the United States Dispensatory, and still continues as the chemical editor of this great reference book. In 1891 he published the first edition of his "Industrial Organic Chemistry," which has since gone through four editions, having a wide circulation in this country and in England, and has appeared abroad in authorized German and Russian translations. In 1895 he published, jointly with his colleague, Prof. Henry Trimble, the first edition of "Sadtler and Trimble's Pharmaceutical and Medical Chemistry." This has run through four editions, becoming known, after the death of Professor Trimble, as "Sadtler and Coblentz's Text-book." He attended the national conventions of 1890, 1900, and 1910 for the revision of the United States Pharmacopœia, as a delegate from the Philadelphia College of Pharmacy, and was elected by the conventions of 1900 and 1910 a member of the Standing Committee of Revision, in which capacity he is serving at present. He has contributed, in addition, many scientific papers to the chemical and pharmaceutical journals, and delivered many public addresses on chemical and technical subjects.

Professor Sadtler is an active member of numerous scientific societies, among which may be mentioned the American Philosophical Society, of which he was secretary from 1898 to 1902; the American Association for the Advancement of Science; the American Chemical Society, serving in the council of the latter for a number of years; the American Electrochemical Society, of which he was vice-president; the Chemical Societies of London and Berlin and the Society of Chemical Industry and The Franklin Institute, of which he was a manager for a number of years, and of which he is now emeritus professor of chemistry. As professor of chemistry in the latter institution he delivered for a number of years the chemical lectures in the popular course, and likewise presented to the members numerous advances in chemistry in special lectures. When the American Institute of Chemical Engineers was organized, eight years ago, he was unanimously elected its first president, and he has continued active in its management ever since, visiting all the great industrial centres of the country in attendance on its meetings. In this connection he has also come into close personal contact with the most prominent chemical manufacturers of the United States and Canada. Of distinctively pharmaceutical societies, he is a member of the American Pharmaceutical Association and the Pennsylvania State Pharmaceutical Association. He is also a member of the Chemists' Club, of New York, and of the University Club, the Engineers' Club, and the City Club, of Philadelphia.

In 1902, Pennsylvania College, at Gettysburg, Pa., honored him on the occasion of the thirty-fifth anniversary of his graduation by conferring on him the honorary degree of Doctor of Laws, and in 1912 the Philadelphia College of Pharmacy conferred the honorary degree of Master of Pharmacy.

Prof. Samuel P. Sadtler became an active member of the Philadelphia College of Pharmacy in 1879, and in the following year was elected as one of its trustees and continues as such to date.

He has served on many of the important committees of the college, and has been chairman of the Committee on Publication of the American Journal of Pharmacy since 1895.

OPIUM ASSAY: COMPARISON OF THE METHODS OF THE UNITED STATES AND BRITISH PHARMACOPŒIAS.

By Carl E. Smith.

It will be generally conceded that no method for the quantitative determination of morphine in opium has yet been published that is capable of the degree of accuracy highly desirable in a medium that serves as a basis for price adjustments of a drug as costly as opium. The assay methods of the pharmacopœias have been arranged and adapted primarily for the adjustment of doses, for which purpose they are reliable enough, with few exceptions. A fair degree of accuracy is all that can be expected in their application, since editors of pharmacopœias take the stand that pharmacopœial methods of testing should be simple enough to be used successfully by pharmacists having only limited practice and training in analysis. But simplification of analytical procedures often entails a sacrifice in precision of results, and this is particularly true of opium assays. Buyers and sellers of large quantities of opium, therefore, do not generally rely upon pharmacopœial assay methods to ascertain as closely as possible the morphine contents of this drug.

The method of the British Pharmacopœia of 1914 may be expected to have the same limitations as others of its kind. Nevertheless, it is of interest because it is one of the latest in this field having official sanction and, therefore, may be expected to embody, to some extent, such advances as have been made in recent years in this branch of analysis. In its present form it has not been in use long enough for many data concerning it to have accumulated, and the writer has not yet seen any reports of critical study that furnish a clue as to the degree of accuracy of which it is capable. Such data would be useful, also, in view of the prevailing differences of opinion in this country about the relative merits of lime methods, of which the British is an example, and methods of the type originated by the late Dr. E. R. Squibb, as adopted by the U. S. P. in the seventh and eighth revisions.

The process of the eighth revision was held by Dr. Squibb to yield results a little too low, as he was able to obtain in actual manufacture somewhat larger yields of morphine than assays of the opium by that method indicated it to contain. It should be considered, however, that when Dr. Squibb made that statement medicinal morphine and its compounds contained notable proportions of unsuspected impurities that would not now be tolerated and which appreciably increased manufacturing yields. Dr. A. R. L. Dohme[1] considers the U. S. P. method to give *much too low* results. A manufacturer of opium alkaloids, who bases his conclusion on manufacturing yields by up-to-date methods, has stated to the present writer his conviction that the process gives *too high* results. These are only a few examples of the many differences of view that tend to throw doubt upon the reliability of the U. S. P. method.

The B. P. method, not being accessible to many American readers as yet, is copied here in full:

OPIUM ASSAY METHOD OF THE BRITISH PHARMACOPŒIA OF 1914.

Opium, in No. 50 powder, dried at 60°	8 grammes
Calcium Hydroxide, freshly prepared	2 grammes
Ammonium Chloride	2 grammes
Alcohol (90 per cent.)	of each a sufficient quantity
Ether	
Distilled Water	

"Triturate together the Opium, *calcium hydroxide*, and 20 millilitres of *water*, in a mortar until a uniform mixture results; add 60 millilitres of *water* and stir occasionally during half an hour. To 51 milliliters of the filtered liquid (representing 5 grammes of Opium) in a convenient vessel add 5 millilitres of *alcohol* (90 per cent.), and 25 millilitres of *ether*; shake the mixture; add the *ammonium chloride*, shake well and frequently during half an hour; set aside for 12 hours for the morphine to separate. Counterbalance two small filters; place one within the other in a small funnel in such a way that the triple fold of the inner filter shall be superposed upon the single fold of the outer filter; wet them with ether; remove the ethereal layer of the liquid in the vessel as completely as possible by means of a small pipette, transferring the liquid to the filter; rinse the vessel with 10 millilitres of *ether*, again transferring the ethereal layer, by means of the pipette, to the filter; wash the filter with a total of 5 millilitres of *ether*, added slowly and in portions. Let the filter dry in the air and pour upon it the contents of the vessel in portions, in such a way as to transfer the granular crystalline morphine as completely as possible to the filter. When all the liquid has passed through, wash the remainder of the morphine from the vessel with *morphinated water* until the whole has been removed. Wash the crystals with *morphinated water* until the washings are free from colour, allow the filter to drain, and dry it, first at 60° and finally, for two hours, at 115°. Weigh the crystals in the inner filter, counterbalancing by the outer filter. Dissolve 0.2 gramme of the crystals in 10 millilitres of *N/10 solution of sulphuric acid,* and titrate back with *N/10 solution of sodium hydroxide, solution of methyl orange* being used as indicator. Each millilitre of the acid neutralised by the alkaloid corresponds to 0.0285 gramme of pure anhydrous morphine. The weight of pure anhydrous morphine obtained, as indicated by the titration, plus 0.051 gramme, the average loss of morphine during the process, together amount to 0.5 gramme, representing in 100 grammes of the dry powdered Opium 10 grammes of morphine, calculated as anhydrous. *Limit of error* 0.5 gramme in excess or defect."

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[1] *Jour. Am. Phar. Ass.*, 1915, vol. 4, p. 85.

"Morphinated Water, prepared by digesting pure Morphine in Chloroform Water for seven days at a temperature of 15.5°, shaking occasionally so as to obtain a saturated solution of the alkaloid, and filtering from the undissolved morphine."

COMPARATIVE ASSAYS.

The assays given below are of a specimen of powdered opium bearing the label of Merck & Co., and stated to contain the U. S. P. percentage of morphine.

To facilitate comparison, the results in this paper are in all cases stated as hydrated morphine.

PER CENT. OF MORPHINE FOUND.

	U.S.P., 8th Rev.	B.P., 1914
	12.19	12.37
	12.10	12.48
	12.23	12.33
	12.21	12.34
Mean result	12.18	12.38

It is seen that with this particular sample no marked differences in results were obtained by the two methods, though a tendency toward somewhat higher figures are shown by the B. P. method. But it would not be safe to conclude that a similar concordance of results by the two methods would be obtained, or that the British process would consistently give a little higher results with any and all kinds of opium of abnormal composition. The methods differ radically in their means of arriving at the end, and opium from different sources varies much in the proportions of constituents that contaminate the precipitated alkaloid and probably, to some extent, affect its solubility in the precipitate liquors.

The U. S. P. assumes that those impurities in the morphine which are not excluded by the lime water correction compensate with sufficient accuracy for the loss of morphine in the precipitate liquors. The proportion of such impurities, however, is subject to a wide variation. In a considerable number of assays of various kinds of opium by the U. S. P. method the writer has found in the morphine, besides matter insoluble in lime water, from 5 to 11 per cent. of other impurities—much too great a variation to be counterbalanced with any degree of certainty by the loss of morphine in liquors.

Attention should be called here to the rather vague directions in the U. S. P. pertaining to washing the crystals on the filter with the alcohol solution of morphine. It is important, though not stated, that washing with this solution be continued until the washings are practically colorless. This requires 10 Cc. *or more.* Failure to do this may cause the crystals to retain a much larger quantity of alcohol-soluble impurities than is allowable. Some years ago the writer was asked to investigate the causes of discrepancies in assays of a number of lots of opium, when the analyst representing one side persistently obtained higher figures than the other side. The differences were found to be due to nothing else than insufficient washing with the alcohol solution of morphine. The procedure of washing as here advocated was used in the laboratories of the late Dr. E. R. Squibb when the writer was in his employ and made many such assays.

In the B. P. it has been sought to overcome the variable error due to impurities in the morphine by an attempt to determine the actual morphine in the crude crystals by titration with acid and by adding to the quantity so found the quantity assumed to remain in the precipitate liquors. The same procedure has sometimes been proposed for use with the U. S. P. method. With lime methods this is doubtless a nearer approach to accuracy, though sources of error still remain. With the U. S. P. method this plan is liable to lead to much too high results.

Manufacturers of opium alkaloids have long known the difficulty of separating codeine from morphine by means of ordinary processes of crystallization and precipitation, and morphine compounds of the market commonly contain this alkaloid; up to a few years ago it was not unusual to find 5 per cent. or more. But the fact that morphine separated from opium under the conditions of the assay methods now under discussion may contain up to 3 per cent. of its weight of ether- and chlorform-soluble alkaloid, chiefly codeine, seems to have escaped general notice, so far as the literature on opium assay is evidence. Codeine, being a strong base, is consequently included as morphine in titrations of the crude alkaloid. Even after a second precipitation from a lime solution containing alcohol, in the "Mallinckrodt Re-assay," the writer has invariably found in morphine from all types of precipitation processes from 1 to 2 per cent. of codeine, whenever he has looked for it. In view of the ready solubility of free codeine in all of the liquids used in both of the processes being discussed, this might well be doubted by those who have not proved it for themselves. That is easily done, however, by dissolving the twice-precipitated morphine in fixed alkali solution and shaking out with ether. The residue remaining after evaporation of the ether will usually yield the codeine pure enough for identification by means of the customary color reactions and the melting-point.

In the morphine from the comparative assays by the B. P. method, reported above, other alkaloids were found equivalent to 2.31 per cent. of its weight of codeine, as determined by titration of the extract obtained with immiscible solvent; in that from each of two pairs of assays by the U. S. P. method, 2.21 and 2.34 per cent., respectively, were found. It will be seen that the discrepancy caused by including this in the titration as morphine cannot be ignored when the highest possible degree of accuracy is desired.

Another source of variable error, also additive in its effect, is often overlooked by those advocating titration of morphine obtained by either of the two types of methods. Lime methods cause contamination of morphine with varying quantities of matter insoluble in both alcohol and lime water, and these often neutralize enough acid to introduce an appreciable error in the titration. The alkalinity of these substances is, at least in part, due to presence of calcium carbonate, which cannot be entirely excluded because of the nature of the method. Morphine from U. S. P. assays sometimes contains more than 10 per cent. of its weight of matter insoluble in alcohol or lime water, of which calcium ammonium meconate forms a large proportion. It is well known that this insoluble matter may neutralize much mineral acid under the ordinary conditions of alkaloid titration. If, therefore, the B. P. procedure of titrating the crude morphine be applied to the U. S. P. method, the final results will in many cases be very much too high.

An example will illustrate the effect of only a small quantity of such insoluble impurities, also that of an average amount of chloroform-soluble alkaloid.

The sample of opium reported upon above yielded in one case 12.49 per cent. of crude morphine by the U. S. P. method. The lime-water correction applied to a portion of this gave 12.21 per cent. as the final result by that method. Another portion was dissolved in N/10 acid and titrated back with N/20 alkali, with methyl red as indicator. Another portion was boiled with alcohol and the insoluble matter filtered out and washed until the washings were free from alkaloid. This insoluble matter was also titrated. The alcohol solution and washings were evaporated to dryness, the residue dissolved in caustic soda solution and shaken out with chloroform. The filtered chloroform solutions were evaporated to dryness and the residue titrated. The results were as follows:

		N/10 acid required
1.249 Gm. of crude morphine		40.39 Cc.
Alcohol insoluble matter in it	1.11 Cc.	
Chloroform soluble matter in it	0.87 Cc.	
		1.98 Cc.
Actual morphine in it (so far as known)		38.41 Cc.
38.4 Cc. of N/10 acid represent	1.156 Gm. of morphine	
Additive correction for solubility of morphine in precipitate liquors	0.056 Gm.	
	1.212 Gm., or 12.12 per cent. of morphine.	

Had the correction for other alkaline substances in the crude morphine been omitted, the result by titration would have been 12.72 per cent., obviously too high. That the U. S. P. (Squibb) method may give results that agree closely with those arrived at with this more complicated procedure is also shown by this example, but data are at hand indicating that this may be rather an exception. Two samples of "gum" opium (sources unknown) gave distinctly higher results by the official method, and in triplicate tests of one of them there was also a greater variation in the result than when corrections for impurities and solubility were made. These differences are shown below.

Opium	Per cent. morphine U.S.P. method	U.S.P. method corrected
(1)	11.40	11.01
(2)	14.91	14.44
	14.68	14.35
	14.79	14.37

It is difficult to escape the conclusion that the U. S. P. method with lime-water correction only has a tendency of giving somewhat too high figures.

The solubility figure used above was determined as follows: One gramme of fully hydrated morphine, free from uncombined moisture and chloroform-soluble alkaloids, was dissolved in a moderate excess of dilute sulphuric acid. The solution was diluted with water to 20 Gm., then subjected to the U. S. P. procedure for precipitation of morphine. After standing over night at room temperature (during hot weather) the mixture was kept at 15° to 16° for three hours, the morphine then filtered out, washed and dried as usual. The loss, which scarcely differed in duplicate determinations, was 0.056 Gm.

It is not a simple matter to determine accurately the small quantity of morphine remaining in assay liquors, which is mixed with a much larger quantity of other alkaloids and other interfering materials. The few attempts so far made by the writer, as time permitted, by means of ether, iso-butyl alcohol and chloroform mixture, etc., gave results far from convincing, and for that reason these are not included in this report. The figure obtained with pure morphine is probably only slightly lower than the quantity of morphine lost in actual assays, provided the necessary conditions for obtaining a maximum precipitation are strictly adhered to, particularly in regard to sufficient agitation, time allowance, and low temperature. Moreover, it is quite possible that any small deficiency in this solubility figure may be counterbalanced by small quantities of alkaline impurities in the morphine that have not been discovered and, therefore, are not allowed for.

The B. P. assays given in this paper were also checked by a correction for alkalinity of substances soluble in chloroform and insoluble in alcohol. In comparison with the same procedure applied to the U. S. P. assays of the same sample the following differences are shown:

	U.S.P.	B.P.
Official method	12.21 per cent.	12.38 per cent.
Corrected	12.12 per cent.	11.96 per cent.

Although corroboration of the data presented in this paper by comparative tests of all kinds of opium are very desirable, there is enough evidence to warrant at least the tentative inference that both the U. S. P. and the B. P. method have a tendency toward somewhat too high results, but that neither method is liable to give results very far from the truth.

For rapid approximate results the writer favors lime methods and methods of the type adopted by the German Pharmacopœia of 1910, as they are expeditious and require comparatively little labor, but for the highest degree of precision possible under the present conditions of incomplete knowledge he would recommend the Squibb method as given in full detail in Ephemeris, vol. 3, p. 1150, and in the United States Dispensatory, nineteenth edition, with omission of the lime-water correction and substitution for it of titration of the morphine, corrections to be made for alkaline impurities and for solubility. Several variations in procedure being possible, the following is proposed as the simplest:

Correction for U. S. P. (Squibb) Method of Opium Assay.

Mix thoroughly the weighed crude morphine from 10 Gm. of opium and divide it in two equal portions. Boil one portion in a 100-Cc. flask with about 50Cc. of neutral (preferably absolute) alcohol, reserving the other for a duplicate determination or for use in case of accident. Continue heating until there is no further visible diminution of undissolved residue. Filter out insoluble matter and wash it with hot alcohol until the washings are free from alkaloid. Dilute the filtrate and washings with an equal volume of distilled water that has been rendered neutral to methyl red, if necessary, and titrate the solution with N/10 acid, using methyl red as indicator. Evaporate the alcohol from the titrated solution below a boiling temperature, add fixed caustic alkali solution moderately in excess of the quantity required to convert the morphine into alkali morphinate, and shake it out with three 10-Cc. portions of chloroform. Filter the chloroform extracts successively through a small, dry filter, wash the filter with chloroform, and evaporate filtrate and washings to dryness. Determine the volume of N/10 acid required to neutralize the extracted matter and subtract it from the volume required for the first titration. The remainder, multiplied by 2, gives the volume of N/10 acid representing the morphine in the crude alkaloid from 10 Gm. of opium. To the weight of hydrated morphine so found add 0.056 Gm. The sum, multiplied by 10, gives the percentage of hydrated morphine in the opium.

The volumetric solutions should be standardized with pure morphine and the titrations for that purpose performed in the same way as in actual determinations.

The procedure advocated above is applicable also to lime and other precipitation methods, with a suitable readjustment of the solubility figure.

The writer agrees with Dr. Dohme [2] that shaking-out methods are likely in the future to supplant precipitation methods of opium assay, but he also concurs in the view of Dr. A. B. Lyons [3] that these newer methods still require a thorough trying-out to establish their reliability and their superiority over those generally accepted. In trial of published shaking-out methods one is struck with the great tedium attending complete removal of other alkaloids before shaking out the morphine, and the difficulty of obtaining a precise end-point in titrations because of the presence of much color and substances that not only obscure the color changes of indicators, but also impair their sensitiveness. If authors of such processes would publish them in complete detail, it is possible that others might be able to obtain with them such satisfactory results as they do. As it is, each person trying them must waste considerable time in working out the details himself.

SUMMARY.

The conclusion, which requires confirmation with opium of abnormal composition, has been reached that the U. S. P. and B. P. methods give fairly accurate results, with a tendency toward somewhat too high results.

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[2] *Loc. cit.*

[3] *Ibid.*, p. 97.

A method of double titration is proposed, by means of which a nearer approach to accuracy may be attained through elimination of sources of variable error due to presence of alkaline substances other than morphine in the crude morphine obtained in precipitation methods.

A solubility correction figure has been determined for the U. S. P. (Squibb) method and is proposed for use in conjunction with the double titration.

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NOTE ON ALGERITA ROOT.[1]

By Merrill C. Hart.

The supposed therapeutic properties of algerita root had been suggested to us as a subject worthy of a more extended investigation, particularly because it was stated that there was a possibility of the presence of hydrastine. This plant comes into pharmaceutical notice because of its use by Mexicans and old settlers in western Texas. Infusions of the root are used for "eye sores," while chewing the roots is considered reliable as a corrective for "sore mouths." Injections of an infusion have been used for gonorrhœa. Although the appearance of the root, as well as its botanical relationships, indicated that it differed but slightly from common barberry as to its alkaloidal constituents, a brief study was carried out.

The material examined consisted of the roots of *Odostemon trifolatus* (Moric.) Heller[2] (*Berberis trifoliatus,* Moricand), a member of the Berberidaceæ. Algerita grows most abundantly in the rough country and along the foot-hills of western Texas and New Mexico, and extends down into adjacent Mexico. It is a rigid shrub,[3] 2.5 to 30 dm. tall; leaflets rigid and coriaceous sessile on the apex of the petiole, oblong or lanceolate, 3 to 7 lobed or toothed, the teeth and tip spinescent; flowers, saffron-scented; berries, globose, and the size of a pea.

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[1] Contribution from the Chemical Research Laboratory, the Upjohn Company.

[2] Muhlenbergia 7, 139, 1912.

[3] Robinson, B. L., "Synoptical Flora of North America."

A quantity (210 g.) of the finely ground root was exhausted by percolation with hot 95 per cent. alcohol. The percolate was concentrated to a volume of 450 Cc., and then 150 Cc. ether and 15 Cc. of sulphuric acid were added. A yellow crystalline deposit of berberine sulphate separated, and this was filtered off on suction after several days. Various procedures failed to increase the yield above that obtained in this manner. The weight of berberine sulphate was 3.38 g., equivalent to 1.31 per cent. berberine. After one crystallization from dilute alcohol containing sulphuric acid it was analyzed.

0.3983 g. gave 0.2179 g. $BaSO_4$.

Calc. for $C_{20}H_{17}NO_4.H_2SO_4 : H_2SO_4 = 22.6$; found 22.9 per cent.

The berberine sulphate, when treated with a solution of sodium hydroxide, turned dark red at first, and upon further addition of alkali a citron yellow precipitate of berberinal was formed. It melted at 143° to 144°.

The original filtrate from the berberine sulphate was diluted with water and concentrated somewhat to remove the ether and some of the alcohol. It was then rendered alkaline and repeatedly extracted with ether. The solvent was removed and the residue (1.3 g.) was dissolved in alcohol and put aside. After prolonged standing considerable non-alkaloidal material separated. The entire fraction was taken up in 5 per cent. sulphuric acid. The acid solution was exhaustively extracted with ether and with chloroform, and then rendered alkaline with ammonia. The alkaloidal material now extracted with ether and with chloroform weighed 0.25 g. (0.11 per cent.).

The original filtrate from the berberine sulphate which had been extracted with ether was repeatedly extracted with chloroform (2.5 L.). After removing the solvent, the residue yielded a further quantity of berberine as sulphate, amounting to 0.465 g. of berberine sulphate. This brings the yield of berberine up to 1.49 per cent. This fraction contained also a slight amount of syrup of alkaloidal nature, from which nothing of a crystalline nature was obtained.

The original solution was now practically free from alkaloid. It is thus shown that the alkaloidal material present in Algerita root is essentially berberine. The amount of berberine in *Berberis vulgaris* is about 1.3 per cent., while Algerita yielded 1.49 per cent. Hydrastine is absent in Algerita, and the associated alkaloids are present in quantities amounting to approximately 0.1 per cent.

Kalamazoo, Michigan, April 10, 1916.

THE ASSAY OF SPIRIT OF PEPPERMINT.

By H. L. Thompson, College of Pharmacy, University of Nebraska, Lincoln.

An article entitled "Estimation of Oil of Peppermint in Spirit of Peppermint," by Chas. H. LaWall, appeared in the December, 1913, issue of the *Journal of the American Pharmaceutical Association.* This method was tried out, and is good in calculating percentage by volume of alcohol and of oil of peppermint. The one objection to this method is that the addition of the hydrochloric acid destroys the menthyl acetate content of the oil of peppermint used in making the spirit of peppermint, and the possibility of a true analysis of the original oil is thereby lost. Furthermore, the amount of spirit used allows an insufficient amount of oil to be used in further assay.

Many oils of peppermint have appeared on the market which are not rectified, and which, in many cases, are dementholated or adulterated. These oils, being much cheaper, are often used in making the spirit of peppermint. It is therefore necessary not only to determine the amount of oil in the spirit, but the quality of the oil used, and it was with this idea in view that this work was undertaken.

There are seventeen substances in oil of peppermint, and, according to Power and Kleber, in the assay, all the esters are calculated as menthyl acetate, and the alcohols as menthol. The menthone content is usually neglected.

Into a tared 50 c.c. volumetric flask, at 20° C., introduce 50 c.c. of spirit of peppermint, and note the weight of the spirit.

Pour the spirit of peppermint into a cassia flask, and rinse the volumetric flask with three 10-c.c. portions of distilled water at about 50° C., and add to the cassia flask. Then rotate the flask, and add sufficient water to bring the oil into the neck of the cassia flask; stopper, and let it stand for four or more hours.

Then read the volume of the oil and calculate the percentage by volume of oil in the spirit by dividing the volume of the oil by the volume of the spirit, and multiplying by 100 to give direct percentage.

Separate as much of the oil as possible by means of a small pipette, using a 1- or 2-c.c. pipette, or a dropper, being careful not to draw out any of the aqueous layer, and filter the oil into a previously-weighed graduated cylinder of 10 c.c. capacity, graduated to tenths of a cubic centimetre. Weigh the cylinder and oil, noting volume and weight of the oil.

Calculate the weight of the oil in the spirit of peppermint from the number of cubic centimetres in 50 c.c. of the spirit compared to the volume and weight of the filtered oil in the 10 c.c. graduated cylinder, by ratio and proportion; namely, c.c. of oil in 10 c.c. cylinder: weight of oil in 10 c.c. cylinder : : c.c. of oil in spirit : x, or the weight of oil in spirit.

Use the weight obtained as the weight of the oil in 50 c.c. of spirit in calculating for menthyl acetate and menthol.

Separate the few drops of oil remaining by means of a filter-paper in rolls, introduced into the neck of the cassia flask to absorb the excess oil. Keep the hydro-alcoholic liquid to determine the percentage of alcohol by weight and volume.

Pour the filtered oil of peppermint into an Erlenmeyer flask and note its weight by difference. To this add 25 c.c. half-normal alcoholic sodium hydroxide, and boil on a water-bath with a reflux condenser for one hour. Add 3 drops of phenolphthalein indicator, and, if the red color is very difficult to see, dilute with 50 to 100 c.c. of distilled water. Titrate back the excess of half-normal alcoholic sodium hydroxide with half-normal hydrochloric acid.

Note the number of cubic centimetres of half-normal alcoholic sodium hydroxide consumed, and calculate the percentage of menthyl acetate as per tables appended.

Transfer the solution to a Squibb's separatory funnel, and wash the residual oil, which contains menthol, at least two or three times, and separate.

Transfer the oil to an acetylization flask, add 1 gramme of anhydrous sodium acetate and 5 c.c. of acetic anhydride, and boil gently for one hour, using a sand-bath.

Transfer the acetylized oil to the separator, and wash twice with water, add 3 drops of phenolphthalein indicator, about 50 c.c. of water, and just enough dilute sodium hydroxide solution, preferably half-normal sodium hydroxide solution, to turn the aqueous layer pink. Wash the oil once more, and separate.

Then filter the separated oil into a 10-c.c. graduated cylinder, previously weighed. Note the volume of oil and weight of cylinder and oil. Pour the acetylized oil into another Erlenmeyer flask, and note its weight by difference. Add 25 c.c. half-normal alcoholic sodium hydroxide, and boil on the water-bath with a reflux condenser for one hour. Cool, add 3 drops of phenolphthalein indicator. If the end-point cannot be clearly seen, dilute with 50 to 100 c.c. of distilled water, and titrate back with half-normal hydrochloric acid. Note the number of cubic centimetres of half-normal alcoholic sodium hydroxide consumed. Calculate the percentage of menthol (free and as ester) by use of the appended tables.

To determine the alcohol content in the spirit, pour the hydro-alcoholic solution into a distilling flask. Rinse the cassia flask with 100 c.c. of distilled water, and add it to the distilling flask.

Distil the alcohol, collecting it in a tared 100-c.c. volumetric flask until nearly 100 c.c. of distillate are obtained. Make to volume, weigh, and determine the specific gravity. Make correction to correspond to specific gravity at 15.6° C. Obtain the percentage of alcohol by weight corresponding to the specific gravity from the U. S. P. VIII alcohol tables, pages 603 to 607, or Table II, page 203, Bulletin No. 107 (revised), Bureau of Chemistry, U. S. A. Multiply this figure by the weight of the distillate and divide by the weight of the sample of spirit of peppermint taken to obtain the percentage by weight of alcohol.

From the specific gravity of the distillate obtained under the determination by weight find the percentage of alcohol by volume from the U. S. P. VIII (revised) alcohol tables, pages 603 to 607, or from Table II, p. 203, U. S. Bulletin No. 107. Multiply this figure by the volume of distillate (calculated from the specific gravity) and divide by the volume of the sample of the spirit of peppermint, thus obtaining the percentage of alcohol by volume in the original sample of spirit of peppermint.

The appended table is based on sodium hydroxide, NaOH – 40; menthyl acetate, $C_{10}H_{19}.C_2H_3O_2$ – 198; menthol, $C_{10}H_{19}OH$ – 156,: and each twentieth of a cubic centimetre of half-normal alcoholic sodium hydroxide is equivalent to one milligramme of sodium hydroxide, which I have designated sodium hydroxide number, or NaOH No.

In calculating the percentage of menthyl acetate in the original oil, note the number of cubic centimetres of half-normal sodium hydroxide alcoholic consumed, and find its equivalent, in grammes of menthyl acetate, in the acetate column. Divide this number by the weight of the oil taken, and multiply by 100 to give the percentage. Or find the equivalent in milligrammes of sodium hydroxide, in the NaOH No. column, and divide this equivalent by the weight of the oil taken. This gives the sodium hydroxide number for one gramme of the oil. Find this number in the NaOH column, and under the acetate column is its equivalent in grammes. Multiply that number by 100, and it reads percentage directly of menthyl acetate in the original oil.

To calculate the percentage of menthyl acetate in the spirit of peppermint, multiply the weight of the oil in the 50 c.c. of spirit by the percentage of menthyl acetate in the original oil, and divide by the weight of the 50 c.c. of spirit of peppermint. Multiply this number by 100 to obtain the percentage by weight of menthyl acetate in the spirit.

In calculating the percentage of menthol in the original oil, note the number of cubic centimetres of half-normal alcoholic sodium hydroxide consumed, and find its equivalent in grammes of menthol in the alcohol column. Divide this number by the weight of the oil minus the equivalent in the difference column, and multiply by 100 to obtain percentage. Or find the sodium hydroxide number equivalent to the cubic centimetres of alcoholic sodium hydroxide used, and divide this by the weight of the oil taken. This gives the sodium hydroxide number for one gramme of oil. Find this number, and in the alcohol in the original oil column is given the grammes of menthol in the original oil. Multiply this by 100 to read percentage directly.

To calculate the percentage of menthol (free and as ester) in the spirit, multiply the weight of the oil in the 50 c.c. of spirit of peppermint by the percentage of menthol in the original oil and divide by the weight of the 50 c.c. of spirit of peppermint. Multiply this by 100 to obtain the percentage of menthol (free and as ester) in the spirit of peppermint.

Or use the following formulas:

For menthyl acetate in oil:

$$\frac{\text{c.c. N/2 sol.} \times 9.9.}{\text{Weight of oil taken}} = \text{per cent. of menthyl acetate in oil.}$$

For menthyl acetate in spirit:

$$\frac{\text{Weight of oil} \times \text{per cent. acetate} \times 100}{\text{Weight of spirit}} = \text{per cent. of menthyl acetate in spirit.}$$

For total menthol (free and as ester) in oil:

$$\frac{\text{c.c. N/2 sol.} \times 7.8}{\text{Weight of oil taken}} = \text{per cent. of menthol (free and as ester) in oil.}$$

For total menthol (free and as ester) in spirit:

$$\frac{\text{Weight of oil} \times \text{per cent. menthol} \times 100}{\text{Weight of spirit.}} = \text{per cent. of menthol (free and as ester) in spirit.}$$

RESULTS.

No.	Alcohol in spirit,		Oil in spirit,		Menthyl acetate		Menthol in	
	Per cent. weight	Per cent. volume	Per cent. volume	Per cent. weight	In oil, Per cent. weight	In spirit, Per cent. weight	Oil, Per cent. weight	Spirit, Per cent. weight
A	73.36	75.98	10.00	10.83	11.04	1.19	63.06	6.83
B	73.48	75.09	10.00	11.06	10.92	1.20	62.52	6.92
C	73.81	76.44	10.20	10.64	10.85	1.18	63.93	6.80
D	73.72	76.39	10.40	11.37	11.66	1.21	63.45	6.91
E	74.58	77.23	10.00	10.98	14.08	1.54	62.62	6.87
F	78.96	81.78	10.00	11.10	12.76	1.42	63.43	6.88
G	74.03	76.33	10.00	11.05	13.69	1.52	59.86	6.61
H	79.08	81.87	10.40	11.01	10.65	1.17	63.15	6.95

TABLES.

Na No.	N/2 NaOH Al., c.c	Acetate	Alcohol	Alcohol in original oil	Difference
1	0.05	0.00495	0.0039	0.00390	0.00105
2	0.10	0.00990	0.0078	0.00782	0.00210
3	0.15	0.01485	0.0117	0.01246	0.00315
4	0.20	0.01980	0.0156	0.01565	0.00420
5	0.25	0.02475	0.0195	0.01960	0.00525
6	0.30	0.02970	0.0234	0.02355	0.00630
7	0.35	0.03465	0.0273	0.02750	0.00735
8	0.40	0.03960	0.0312	0.03146	0.00840
9	0.45	0.04455	0.0351	0.03543	0.00945
10	0.50	0.04950	0.0390	0.03941	0.01050
11	0.55	0.05445	0.0429	0.04340	0.01155
12	0.60	0.05940	0.0468	0.04750	0.01260
13	0.65	0.06435	0.0507	0.05140	0.01365
14	0.70	0.06930	0.0546	0.05541	0.01470
15	0.75	0.07425	0.0585	0.05943	0.01575
16	0.80	0.07920	0.0624	0.06346	0.01680
17	0.85	0.08415	0.0663	0.06750	0.01785
18	0.90	0.08910	0.0702	0.07155	0.01890
19	0.95	0.09405	0.0741	0.07543	0.01995
20	1.00	0.09900	0.0780	0.07786	0.02100
21	1.05	0.10395	0.0819	0.08374	0.02205
22	1.10	0.10890	0.0858	0.08783	0.02310
23	1.15	0.11385	0.0897	0.09192	0.02415
24	1.20	0.11880	0.0936	0.09602	0.02520
25	1.25	0.12375	0.0975	0.10013	0.02625
26	1.30	0.12870	0.1014	0.10424	0.02730
27	1.35	0.13365	0.1053	0.10862	0.02835
28	1.40	0.13860	0.1092	0.11239	0.02940
29	1.45	0.14355	0.1121	0.11562	0.03045
30	1.50	0.14850	0.1160	0.12011	0.03150
31	1.55	0.15345	0.1209	0.12497	0.03255
32	1.60	0.15840	0.1248	0.12915	0.03360

Na No.	N/a NaOH Al., c.c	Acetate	Alcohol	Alcohol in original oil	Difference
33	1.65	0.16335	0.1287	0.13332	0.03465
34	1.70	0.16830	0.1326	0.13750	0.03570
35	1.75	0.17325	0.1365	0.14170	0.03675
36	1.80	0.17820	0.1404	0.14598	0.03780
37	1.85	0.18315	0.1443	0.14672	0.03885
38	1.90	0.18810	0.1482	0.15436	0.03990
39	1.95	0.19305	0.1521	0.15896	0.04095
40	2.00	0.19800	0.1560	0.16384	0.04200

GERMAN DRUG PRICES FOR 1916.

By Bertha Mueller, P.D., Assistant Pharmacist of the German Hospital, Philadelphia.

The official edition of the "Deutsche Arzneitaxe 1916" is very interesting and instructive, in as far as it shows how existing conditions are really carefully studied, and how laws are passed to meet these conditions.

The book is divided into two main parts:

I. A general discussion of the methods for determining the price of a compound medicine and,

II. A price list of the more frequently used drugs and medicines.

In Germany the price of a compound medicine is to be determined:

1. By the price of the ingredients that enter into its manufacture.

2. By the permissible price for time and labor required in preparing and dispensing the same.

3. By the permissible charge of the container in which the medicine is dispensed.

The selling price of drugs and preparations must be based on the purchase price of the crude drug according to specified rules. This constitutes the foundation price. If a drug must be comminuted, a certain specified sum is permitted to be charged. This sum varies with the time and labor required for preparing powders of different degrees of fineness. Provisions are also made for charging a specified sum for packing and freight.

The price of a galenical is calculated from:

1. The price of the individual drug quantities that enter into its manufacture.

2. The charges permitted for time and labor.

3. The permissible compensation for loss of material during manufacture in cases where such loss is sustained.

In order to compensate for the average loss (which amounts to about 10 per cent.) sustained in the manufacture of galenicals, the selling price of such galenicals, calculated from the price of the crude drugs that enter into their manufacture plus the permissible charges for time and labor, is raised by one-ninth its value. A table is included giving the charges that may be made for time and labor required in preparing the various galenicals. The price is fixed for one kilogram quantities.

The permissible charges for compounding and dispensing a medicine are given in considerable detail. A table is included giving fixed prices for preparing definite quantities of solutions, decoctions, infusions, ointments, pastilles, pills, suppositories, etc. The apothecary, in compounding and dispensing a medicine, must calculate charges for work done according to this standard.

The charges for containers are also a matter of detailed consideration, and a price list is appended for the various containers. For clean containers returned to pharmacies for renewal, full credit must be allowed.

The following rules exist concerning the use of containers in dispensing medicines to public institutions and charitable organizations, and in dispensing medicines for veterinary purposes:

If medicines are dispensed to public institutions and charitable organizations, and for veterinary purposes, the more expensive containers, as glass-stoppered bottles, white porcelain ointment jars, pasteboard boxes, etc., may only be charged for if the prescriber has ordered the medicine to be dispensed in such a container. If, however, powders or pastilles containing opium, or any of its alkaloids, or chloral hydrate are dispensed, they must be put into a pasteboard box, and permission is given to charge for the container. In dispensing eye-salves, it is permitted to use white porcelain jars with lids and charge for them.

The price of a prescription is computed from the official price lists, and it is required that the individual parts that compose the selling price be recorded in detail on the prescription. If any prescription is of such a nature that an ingredient (an excipient, for instance) which the prescriber failed to write for must be added, and such ingredient influences the price of the finished preparation, the apothecary must make a record of the same on the prescription. An extra charge is permitted for all prescriptions filled during the hours from 9 P.M. to 7 A.M. (night price).

The selling price of all medicines sold in original containers is based on their purchase price according to specific rules. Charges for dispensing may not be made if the preparation is sold in original container. If, however, a smaller quantity is ordered than the original package contains, the apothecary doubles the purchase price and charges for dispensing and for the container.

Homeopathic tinctures and dilutions thereof come under a separate price list. All charges for work done in preparing and dispensing such medicines are calculated according to the official Time and Labor Compensation price list.

Charges for special messenger, postage, etc., can be made only if the dispenser can prove that he has incurred and has notified the purchaser in advance of such extra expenses.

Drugs that are protected by patent or by trade-mark patents are enumerated in the price list, both under the protected and under the free or scientific name, and the price to be charged for the medicine as dispensed is to be determined by the name under which the drug was ordered.

To the American pharmacist the book is of interest primarily as an illustration of the comprehensive and thorough system prevailing in Germany at the present time to safeguard all parties interested

By this system the public, especially, is protected against overcharges and a uniformity of prices of widely-used commodities is secured.

GENERAL PROBLEMS AND TENDENCIES IN CANCER RESEARCH.[1]

By Prof. Leo Loeb.[2]

After the successful continuous transplantation of rat sarcoma and mouse carcinoma had shown that we possessed a method suitable for the study of the biology of tumors, and which promised a rich harvest of results, the decade following the year 1901 was to a great extent devoted to the study of propagated tumors rather than to the analysis of the first origin of tumors, although this latter problem had never been entirely neglected. Within recent years, however, much attention has been given to the origin of tumors. The so-called endemic occurrence of cancer which we observed in the case of cattle and rats, and which certain investigators noted in the case of mice and other animals, suggested to us sixteen years ago the possible significance of heredity as an etiological factor. Some years later, observations which we made in a mouse-breeding establishment in Granby confirmed this hypothesis; but it is only during the last six years, following the observations of Tyzzer and Murray, that our investigations, carried out in conjunction with Miss Lathrop, proved on a very broad basis the very great significance of heredity in the transmission of cancer in mice, the partial independence of the age and frequency factors, and the correlation between cancer frequency and structural and functional characteristics of the animal. The results of hybridization experiments which we carried out on a large scale indicate that in some crosses the tendency to a high cancer rate may be dominant, while in some others the opposite tendency predominates, and in a few an intermediate result is obtained. Our experiments established for the first time the cancer rate for a number of different strains; each strain was followed through several successive generations and in each generation a large number of animals were observed. The resultant figures for the various generations of the same strain were usually in fairly close agreement. Animals belonging to such strains were used for hybridization experiments. The results of hybridization experiments which we obtained do not seem to be compatible with the view recently expressed that the tendency to cancer is of a recessive character and that all results can be explained on such a basis.[3]

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[1] An address before Section VIII of the II Pan-American Scientific Congress on January 5, 1916.

[2] Reprinted from *Science*, N. S., vol. xliii, No. 1105, pp. 293-303, March 3, 1916.

Of a different character is a problem in heredity first studied by E. E. Tyzzer. It is well known that some strains of mice are a favorable soil for a certain transplantable tumor, while other strains are not. In crossing a favorable and an unfavorable strain Tyzzer found conditions apparently incompatible with Mendelian principles. We obtained likewise, in subsequent experiments with M. S. Fleisher. results similar to those of Tyzzer, and we suggested that the results might be explained by assuming the presence of multiple factors. The same interpretation may apply to the heredity of autochthonous tumors to which we referred above and in which also simple Mendelian proportions do not seem to exist.

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[3] Maud Slye, *Interstate Medical Journal,* XXII, July, 1915, p. 692.

These studies of the cancer incidence in various strains of mice and the methods used therein have, however, a much wider significance. On the basis of a thorough knowledge of the cancer incidence in certain families, and on this basis alone, will it be possible to analyze certain other factors in the etiology of tumors, and the understanding of these latter factors, as well as of heredity, will perhaps ultimately provide us with a rational basis for the prevention of cancer. Without a thorough knowledge of heredity, conclusive results as to the significance of other factors could not be expected. Acting on this principle, we found that certain castration in sexually mature mice at the age of three to eight months reduces the cancer rate in a very pronounced way. Prevention of pregnancy, while it still has some effect in reducing the cancer rate, as we found several years ago, has very much less significance than castration.

These results and some additional ones to be mentioned shortly permit us to classify the causes of tumors into two main divisions, internal and external ones. Heredity belongs to the former class. The point of attack of these heredity factors we do not yet know. In some cases, they may perhaps stand in relation to some other internal factors, which are in all probability of significance in certain cases. I refer to the spontaneous parthenogenetic development of the egg within the ovary and elsewhere in mammals, a process which, according to our findings in the guinea pig, is not a rare occurrence, and may even normally proceed to the formation of the anlage of the central nervous system. To this class of factors may also belong developmental errors which were already suspected by Cohnheim and which as we know may appear as inheritable mutations in various groups of animals.

The external factors may be further divided into chemical and mechanical, and both may be derived either from within the body or from the outside world. As an example of a chemical factor originating within the body, we may cite the great importance of the internal secretion of the corpus luteum in the origin of cancer in mice to which we referred above, but other internal secretions will probably be found to be of similar significance. External mechanical factors can be recognized in the well-known effect of chronic irritation. How far certain parasites, especially those in the class of vermes and insects, produce cancer through chemical and how far through mechanical means is not certain. Previous observations in man in the case of cancer of the bladder caused, directly or in-directly, by bilharzia, and especially the recent experiments of Fibiger make it, however, quite certain that such parasites may be the cause of cancer. It is likewise uncertain how far Röntgen-ray cancer, frequent in Röntgen-ray operators, and also apparently experimentally produced in a few rats by Marie, is due to ulceration subsequent to exposure to or to the direct stimulating action of the rays. In some cases perhaps chemical and mechanical factors may coöperate in producing tumors; the efficiency of such a combination in calling forth tumor-like formations has been shown by us in the case of deciduomata of the uterus, which we produced experimentally, a new formation which we included in a class designated as transitory tumors.

There are observations on hand which indicate that growth stimuli may be especially active in animals with an hereditarily determined tendency to cancer. Such an observation we made in the case of a cancer in a mouse belonging to a family rich in tumors, where ulceration of the skin near an adenoma of the mammary gland led to the development of an epidermal carcinoma. Further systematically conducted experiments in this direction might lead to interesting results.

It is, however, not probable that in order to obtain the production of cancer there must be a definite quantity of prerequisite internal factors. On the contrary, there is some evidence on hand which makes it probable that internal and external factors may vary in inverse ratio, and that if the external factors are quantitatively very strong, the quantity of internal factors may be reduced.

If we survey briefly the various types of growth reactions known in vertebrates, we may, perhaps, according to the character of the stimuli, which are usually in each case the first members in a complicated reaction chain, and according to the character of the systems on which they act, provisionally distinguish the following types:

1. Various stimuli act for a short time on complex systems, the egg-cells, and lead to a long chain of growth phenomena which ultimately cease. The experiments in artificial parthenogenesis of Jacques Loeb led to a very far-going analysis of these phenomena.

2. Defects lead to a chain of growth phenomena, which are of a temporary character, and which come to a standstill after a certain quantity and kind of new-formed tissue has more or less completely filled out the defect.

3. Chemical substances stimulate the growth of certain tissues to which they bear a more or less specific relation. These growth phenomena come to a standstill with the activity of the stimulating substance or very soon afterwards (corpus luteum and mammary gland).

4. A combination of factors 2 and 3 may lead to tumor-like growth phenomena when either factor alone would cause only a slight proliferation. Here, again, the effect is temporary (experimental deciduomata of the uterus).

5. Chemical (fat soluble?) bodies which do not show a specific relation to the organs affected stimulate various tissues to a temporary proliferation; fat soluble stains (Bernhard Fischer and others) and ether (Reinke) are substances that under certain conditions seem to exert a stimulating effect.

6. Chemical and mechanical factors produce with the aid of a large quantity of internal factors, or in certain cases apparently without such aid, an increase in cell proliferation that persists after the stimuli have ceased, which is permanent, potentially of unlimited duration in contradistinction to the temporary reactions mentioned above. This is the cancerous reaction with which all or at least the large majority of the mammalian tissues may respond. Neither potential immortality—some, or perhaps all, somatic cells are potentially immortal—nor the power of continued proliferation, which in all probability even certain ordinary somatic cells possess, is characteristic of this reaction, but rather the increase in proliferative power, and furthermore, the permanency of the reaction in response to a temporary, non-permanent stimulus. We have then to assume that a labile cell-system which responds to temporary stimuli with a temporary reaction is transformed under the influence of certain stimuli, and often with the aid of hereditary factors, into a stable system which shows a greater proliferative power than the labile system. The stimulus thus brings about merely a transformation of the cells into a new kind of cell-system, which proliferates indefinitely at a more or less increased rate. Such a transformation may be called a mutation.[4] Inasmuch as all, or the large majority of all, body cells are liable to this change, they must have

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[4] We would have to deal in this case with a mutation not in a germ cell, but in a somatic cell. For a more detailed discussion of this problem *cf.* Leo Loeb, "Germ Cells and Somatic Cells," *American Naturalist*, vol. 49, 1915, p. 286.

from the beginning in their organization a mechanism that provides for the possibility of such a mutation.

According to this conception, we must then assume that all or most cells have potentially two equilibria, the normal one and the cancerous; they begin life with the normal equilibrium, but under the influence of certain stimuli, with or without the coöperation of hereditary factors, they are transferred to the cancerous equilibrium.

Cells in the normal equilibrium react to stimuli in the manner indicated above (types 1 to 5); ultimately they return invariably to the normal equilibrium after the stimulus has ceased to act. Cancerous cells, on the other hand, may perhaps be exterminated, but they are not known to return to the normal equilibrium.

There is, however, an alternative to this conception which would eliminate the necessity for assuming a new equilibrium for cancerous proliferation, an assumption for which naturally no analogy can exist. If we assume that an external agent associated with the cell, rather than a physico-chemical mechanism within the cell, produces the cancerous proliferation, the latter would no longer represent a unique condition, but would be a special application of one of the types 3 to 5, in which, however, the stimulus would act incessantly. Such a stimulus could be supplied through multiplying microörganisms which essentially represent constantly newly formed external chemical stimuli. Such microörganisms would not be identical with bacteria causing various ordinary infectious diseases. As we have shown at an early stage of our investigations, cancer among animals is not infectious in the sense in which certain other diseases are infectious. We could feed tumor tissue to normal animals or keep normal animals in the same cage with cancerous animals without a transfer of the disease taking place; neither could Ehrlich produce cancer in young mice which were suckled by cancerous animals. But this does not exclude the possibility that certain other organisms might play a certain rôle. We know that microorganisms can call forth cell multiplication in plants and animals. In plants, certain bacteria can produce, as has especially been demonstrated in the case of the crowngall by Erwin F. Smith, tumor-like proliferation—a result depending in this case not merely on the kind of stimulus, but also on the particular system on which the stimulus acts. In this connection we might also mention a number of extremely interesting cases in which various investigators saw the transformation of normal into cancerous tissues, subsequent to contact with cancerous tissue of another kind, but in the same individual. I referred above to an observation of this character in which we found skin to become cancerous under the influence of an adenocarcinoma of the mammary gland. Similarly in contact with carcinoma, connective tissue may become sarcomatous. Such tumors we called combination contact tumors. In such a carcinosarcoma in a Japanese mouse which we studied experimentally, we found that the carcinomatous and sarcomatous components followed the same variation curve of growth energy in succeeding generations. This suggests the identity of the agent which causes the proliferation of both tissues and the dependence of the variation in growth upon the variation in the activity of the agent. The agent transferred from one tissue to another might be a chemical substance—an explanation first suggested in the case of the sarcomatous transformation of the stroma by Ehrlich and Apolant—or it might be a microörganism. Even under normal conditions there are indications which point to a chemical influence exerted by one tissue upon another. In this manner we interpreted the differences in cell activity in the connective tissue of the mucosa in certain organs near the epithelium on the one, and near the submucosa on the other hand. The different effect exerted by the tissues of different individuals upon the activity of the fibroblasts of the host also points to such a conclusion (different effects of auto- and homoiotransplantation).

The very important results of Peyton Rous are worthy of especial consideration. This investigator, working with fowls and employing methods which in the case of mammalian tumor had not led to positive results in the hands of earlier investigators, was able to separate by filtration and other means the causative agent from the sarcoma cells with which it was associated. In this case, we might have to deal either with filterable microörganisms, or again with chemical substances. If we accept the latter alternative, we would have to assume that the same substance that initiated the cancerous cell proliferation in normal cells would, after the change has once been accomplished, be perpetually newly formed within the proliferating cells. This condition would in some respects be comparable to an autokatalytic process.[5] The cancerous equilibrium would represent a condition in which this growth substance is either produced in a larger quantity than it exists in normal cells, or is entirely formed *de novo.* It seems furthermore that no antibody is produced in the body-fluid against this substance. These substances do not seem to be separable from the cells in all fowl tumors, and the kinds of fowl tumors in which a separation can not be accomplished behave in this respect like the mammalian tumors. We would have to assume the existence of different substances of this kind, and different substances always call forth a specific activity of connective tissue cells resulting in the reproduction of the original kind of tumor, and stimulating endlessly the production of the same specific substance within the fibroblasts. Just as in the case of the corpus luteum substance which is responsible for the production of deciduomata, the coöperation of a mechanical factor seems to be essential for the stimulation of tumor growth in fowl. We would most probably have to give this interpretation to these phenomena if the observation of Casimir Funk, according to whom an alcoholic extract of the tumor contains the active agent, could be confirmed in a larger number of cases. If this should prove correct, we may expect to find corresponding conditions in mammalian cancer. A study of heredity in cancer of the fowl would close this chain of investigations, and with the analysis of internal and external factors in cancer already on a solid foundation, we could then conclude that the causes of cancer in their main outline have been satisfactorily analyzed. Of course underneath this first plane of causes there are connections which extend further into fields where they meet with other factors determining cell and tissue life in its dependence upon physical and chemical laws, and thus we are led into deeper planes of causation. But here the problems have become identical with those of general biology, the laws governing cell division and ameboid movements in cancer cells not differing from those of other cells.

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[5] Certain analogies between growth curves and autokatalytic processes have formerly been pointed out by Jacques Loeb, W. O. Ostwald, and T. B. Robertson. In the case of fowl tumors we would have in addition to deal with the new formation within the tissue cells of a substance carried to the tissues from the outside.

In this connection a few words concerning the definition of cancer might not be out of place. It might indeed be assumed that a definition of cancer satisfying past and future research is one of the essential requirements for the fruitful pursuit of investigations. On the contrary, I believe that at the present stage of investigation progress may be retarded through premature rigidity in defining cancer, and especially through insisting on the proof that secondary tumors originate from transplanted cells. In the case of sarcoma of the rat and mouse, this proof has so far been supplied only in the rat sarcoma of the thyroid found in Chicago, and is merely based on analogy in the case of the large majority of other sarcomata. Since it has now been shown that in sarcoma of fowl an agent associated with the tumor, but separable from it, may just as well give origin to new growths, we may well hesitate in excluding from consideration new formations which in all probability under certain conditions have their origin in transplanted cells, while in other cases they may perhaps be propagated through an agent associated with the tumor. I refer here especially to the so-called lympho-sarcoma or small round cell sarcoma of dogs which, after transplantation in dogs, apparently grows from the transplanted cells (Sticker, Ewing and Beebe, and L. Loeb), while in the fox, according to von Dungern, the tumor cells are composed of host tissue. May we not, in case von Dungern's view should prove correct, have to consider the possibility that the transplanted dog cells perished in the foreign species, and that the associated agent stimulated the host cells to proliferation?

With the factors which we have already analyzed—factors of heredity, of internal secretion, of external, chemical and mechanical stimulation—we are in a position to control to a great extent the cancer rate in certain species of animals. As we said, we can not yet exclude with certainty the other alternative, namely, micro-organisms, as an additional causative factor.

After so many futile attempts to establish a direct proof of their presence, further efforts of this kind do not appear promising at present. There seem, however, still other ways open through which one may approach this problem in an indirect manner.

To decide between the two alternatives which we mentioned does not only concern cancer research in the more restricted sense, but is of the greatest importance for general biology. In return for much that it received from neighboring sciences, cancer research has given something important to biology; the serial endless experimental propagation of tumors has enriched biology with a valuable instrument of research and new outlooks on the life and character of somatic cells have been gained. We may briefly mention the following facts established or very strongly suggested: In the course of our early transplantations, we found that the energy of tumor growth can be experimentally increased as well as decreased. Ehrlich explained the increase as due to a selection of rapidly growing tumors; we, however, believed from the beginning that it was partly produced by a mechanical stimulation of the tumor cells and in addition was possibly due to chemical stimulation caused by the transfer into a new host with a different constitution of the body-fluids; in some cases perhaps processes of immunity may also enter into this phenomenon.

In conjunction with M. S. Fleisher, we noted that chemical bodies which inhibit tissue growth at a certain period in the life of tumors do not have this power at other periods. Especially are they powerless in the case of very young tumors, an observation confirmed by Keysser. But we found that such early injections produce an immunization against the later action of these substances. The proof thus given that an immunization takes place against substances (and apparently also against physical agencies) inhibiting tumor growth is, as we pointed out on previous occasions, of great importance in our attempts to arrive at a rational treatment of cancer. Our experiments suggest, furthermore, very strongly that this immunity is of a twofold character, that it originates in the host as well as in the tumor cells themselves; that this cell immunity can be transferred to a certain number of later cell generations and is to some extent specific for the substance which had called it forth. While our results, based on the observation of a very large number of animals, strongly suggest these latter conclusions, we nevertheless think it desirable to add new evidence in order to guard against a complication with variable factors.

Are we in all these cases dealing with indirect actions on the cells and with direct actions on accompanying microörganisms, or with direct actions on the cells? We rather incline to the latter view and we would suggest that an increase in chemical activity in the tumor cells—an increase perhaps restricted to certain activities—renders the latter a much finer balance in their response to certain environmental conditions through variations in growth energy than are the normal tissue cells.

As we pointed out in 1901 on the basis of Moreau's and our own experiments, cancer cells are potentially immortal in the same sense in which protozoa and germ cells are potentially immortal. All, or at least the large majority of all, normal tissue cells are potentially cancer cells, and we may therefore with full justification conclude that ordinary somatic cells are likewise potentially immortal. Like the majority of tumors, they can not be indefinitely propagated in other individuals of the same species because of the injurious action of what we may term homoiotoxins. On the other hand, thanks to their increased growth energy and perhaps a lessened sensitiveness to homoiotoxins, the cells of certain tumors can overcome the injurious conditions existing in other individuals of the same species and be propagated indefinitely. Tumor cells and ordinary tissue cells do not differ in potential immortality (as Bashford and others assumed), but in the intensity with which they proliferate and in their destructive power.

Of equally great biological interest are the defensive reactions called forth in the host through the growth of the tumor cells. As one of the most important results, we may here state that no immunity seems to be produced through tumor growth in the animals in which the tumor originated. We found that in the case of rat and dog tumors, cells remained alive and grew after transplantation into the animal in which they originated, while they died in other individuals of the same species. Tyzzer found the same to be true in the chicken, and Haaland and Fleisher and ourselves in the mouse. Haaland's experiments suggested, furthermore, that the autochthonous tumor could not act as antigen and by proving in addition that this tumor does not neutralize immune substances, our experiments prove the correctness of Haaland's suggestion that against an autochthonous tumor no immunity can be produced. The greater significance again attached to the study of animals in which tumors originated in contradistinction to bearers of experimental tumors, is one of the characteristic tendencies of recent cancer investigation, and it is of interest in this connection to note that our experiments indicate that animals with autochthonous tumors are a better soil for the growth of other spontaneous tumors than normal animals.

While, therefore, in the organism in which the tumor originated usually no reaction takes place against tumor cells, reactions do take place after transplantation of tumor cells into other individuals. These reactions are essentially of a similar character in the case of tumors and of normal tissues. Again correlation between the behavior of normal and of cancerous tissues has proven fruitful of results in this case. After autotransplantation of a piece of normal tissue it may, in the same way as a piece of tumor, at least in the case of certain tissues, apparently live indefinitely, while after homoiotransplantation, as we observed, the tissues die as a result of the attack by lymphocytes and through the influence of fibroblasts of the host which produce dense fibrous tissue which in turn strangulates the foreign cells. There is a possibility that the strange body fluids may also directly interfere with the metabolism of certain transplanted tissues to such an extent as to severely injure them. After heterotransplantation the indirect injurious action of the body fluids, which are unsuitable for the metabolism of the transplanted cells, is more pronounced and leads to the early death of the transplanted cells. We found in the case of skin under these conditions no noticeable activity on the part of the lymphocytes and fibroblasts. J. B. Murphy, however, recently showed through very ingenious experiments that in the case of heterotransplantation also lymphocytes, under certain conditions, may be of importance as a defensive mechanism of the host.

It has likewise been shown by such investigators as Burgess, DaFano, Baeslack, Rous and J. B. Murphy, that in the case of tumors against which an immunity becomes established, lymphocytes sometimes, in conjunction with other leucocytes, play a distinct rôle in the destruction of the tumor tissue. This holds good in the case of tumors already established. If immunity is produced before the transplanted tumor has united with the host tissues, the ingrowth of fibroblasts and blood-vessels into the transplanted tissue may, according to Russel and Woglom (in the case of tumors) and Peyton Rous (in the case of embryonic tissues) be delayed or else diminished in amount. However, even in the latter case the defence of the organism against the foreign tumor cells may principally consist in an attack by lymphocytes and other leucocytes (E. E. Tyzzer).

As the most probable explanation for these phenomena, we have proposed the following theory[6]: The mutual chemical incompatibility of the body fluids of one individual and the tissues of another, which we could especially clearly demonstrate after homoiotransplantation of pigmented skins, leads to changes in the metabolism of the tissues, resulting in the production of homoio- and heterotoxins, which, if they do not exceed a certain strength, disturb the normal functions of the transplanted tissues to some extent without, however, interfering seriously with their life. But the abnormal products formed attract the lymphocytes and in certain cases also other leucocytes, and alter the reaction of the fibroblasts, which latter are induced to produce dense fibrous tissue. If the poisons become more active, they may directly injure tissues to such an extent that growth and life become impossible.

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[6] Leo Loeb, "The Influence of Changes in the Chemical Environment on the Life and Growth of Tissues," *Journal American Medical Association*, vol. 64, February, 1915, p. 726.

These conclusions, as we believe, also throw light on so-called chronic inflammatory processes of various organs where a changed metabolism of the cells, and perhaps also poisons produced by microorganisms, may induce fibroblasts to form fibrous bands and attract lymphocytes, thus leading to processes of cirrhosis. In a similar way, in the case of tumor immunity, which, for instance (as Clowes and Gaylord have shown), exists in the case of the retrogression of tumors, substances produced as a result of immunization and which circulate in the body fluids alter the metabolism of the tumor cells, which in turn influence the activity of the leucocytes and fibroblasts in a way similar to normal tissues in a strange host. This theory correlates the immunity against tumor and tissue growth with the immunity against certain substances and non-growing foreign cells. We have also in the former case to deal with the production of immune substances, which, however, in the case of homoiotransplantation, are usually not such that they directly destroy the foreign tissues, but merely lead to an alteration of their metabolism and to the production of substances which change the behavior of the host cells. We no longer need to assume a primary tissue alteration following the homoiotransplantation.

It remains for further investigation to decide to what extent the presence of foreign tissue leads to the direct production of what we could call primary homoio- and heterotoxins as the result of the interaction between the preformed constituents of the body-fluids and the foreign cells, and to what extent it leads to the production of secondary homoio- and heterotoxins—the immune substances—as the result of immune reactions. At present it appears probable that both these substances play a rôle. *In vitro* the toxicity of body fluids of foreign species is apparently not very marked, as we, as well as Lambert, found. The toxicity is certainly less than we should expect, considering the fate of tissues after heterotransplantation. We must, however, take into account the fact that the amount of body fluid and especially of toxin acting on the tissue *in vitro,* is extremely small as compared with the quantity acting in the living body, and that this reduction in the quantity of body fluid is very much greater than the reduction in the quantity of tissue.

Furthermore, in the body the fluid in contact with the tissue is constantly renewed and the old fluid is eliminated. *In vitro* the fluid remains relatively constant. There exists also the possibility that the action of the body fluid is a complex one *in vivo* in a way similar to the complex action after homoiotransplantation. In the case of both types of substances (those preformed and those produced through immunization), we are able to point to analogous substances existing elsewhere, namely, the preformed species-specific tissue coagulins, which play a rôle in the blood coagulation, and the secondarily, artificially produced antibodies of various kinds. It also remains further to be determined how far the metabolic products of foreign cells exert a direct influence upon each other and how much of this effect is dependent upon the interaction between cells and foreign body fluids.

In addition to the effect of toxic substances, mere lack of common food-stuffs can also retard tumor growth, as the retarded growth of transplanted tumors in pregnancy and the feeding experiments of Moreschi, Peyton Rous, Beebe, Sweet, Corson White, and Saxon, Robertson and Burnett have shown. Other substances apparently stimulate tumor growth (Robertson and Burnett). Whether an immunity caused through the lack of specific substances—in contradistinction to the common food and growth stuffs of cells—whether, in other words, an athreptic immunity, as Ehrlich called it, exists, however, is very doubtful. Such an athreptic immunity certainly would not explain the phenomena referred to above, as especially the experiments of Uhlenhuth, Haendel and Steffenhagen, Tyzzer and Levin have shown.

In the retarded cancer growth in pregnancy especially we do not have to deal with a scarcity in specific growth substances, particularly in hormones, as Ehrlich supposed, but with a shortage in the ordinary substances required for the building up of cells. On the contrary, it seems to us very probable that certain hormones which circulate during pregnancy may be of advantage to tumor growth, and that these two antagonistic factors—deficiency in ordinary building material and presence of special hormones—may preponderate unequally in different cases and thus the difference in the effects on tumor growth which certain investigators found in pregnancy may be explained.

In connection with the studies in metabolism to which we have just referred, we may look forward to interesting results through further analysis of the chemical constitution of tumor tissues.

I am, however, inclined to regard the differences so far found between normal and tumor cells in a similar light, as differences observed in the case of mitotic division in normal and tumor cells, both probably being the result and not the cause of the changes in the growth energy characteristic of tumor cells.

Having arrived at the end of our survey, we must confess that much remains still to be done before these investigations can in any way be considered near completion. On the other hand, I believe that I have indicated that there are yet other ways open for further attack upon the problems of cancer and tissue growth, and I hope also that I have been able to convey the impression that the work of so many investigators in this field has not been in vain, and that not only this special branch of science has been built up, but that also biology and pathology in general have been stimulated and enriched as the result of their labors.

Department of Comparative Pathology,
Washington University.

EDITORIAL.

Prof. Samuel P. Sadtler.

The retirement from active service of one who has spent thirty-eight years of his life as a teacher will cause his colleagues of the Faculty and his former students in the Alumni to contemplate in retrospect the progress of the College during these years and his part in the development. When Professor Sadtler succeeded Professor Bridges to the Chair of Chemistry in the Philadelphia College of Pharmacy the time devoted to instruction in this subject consisted of two hours per week, during about five months of the year, to each of the classes. The course consisted of two years, and a perusal of the examination questions as published in this Journal at that time shows that the teaching in fundamental principles was held to be as important as to-day. Indeed, we are prone to conclude that the students of that time were as serious-minded and in after-life attained as great distinction as the graduates of recent years. Of course, the conditions of thirty-five years ago were very different from to-day. The individual counted for more, and there was neither the specialization in the industries and arts nor the combination of capital that there is at the present time.

In 1880, the final examinations in the Philadelphia College of Pharmacy were held from February 28 to March 4. The commencement took place on March 18, and Professor Sadtler was the recipient of a handsome silver tea-set presented to him by the class. From the very first he took a quiet but very deep interest in the College. The Department of Chemistry gradually developed, due largely to his efforts and those of Professor Trimble, until to-day there are courses in chemistry requiring from three to four years of the student's entire time. The graduates in this department usually have been successful, and a number of them occupy positions reflecting credit on themselves and the school. While not actively connected with the laboratory, he has always encouraged practical courses and stimulated students to engage in research work.

Professor Sadtler was made a member of the Publication Committee of the AMERICAN JOURNAL OF PHARMACY in 1895, and has been actively connected as chairman most of this time. Professor Sadtler's fame rests largely on his text-books and his work as an industrial chemist. During the past twenty-five years he has earned a reputation as one of America's foremost chemical experts. For the benefit of the members of the College and the Alumni the main facts connected with Professor Sadtler's career are given elsewhere in this issue.

THE AGE OF CONSOLIDATION.

As a measure of efficiency there can be nothing but praise for the merger of the University of Pennsylvania Medical School, Jefferson College, and Medico-Chirurgical College under a unified control that will enable far better results to be obtained than under the present system. The consolidation is a perfectly natural one, because it is in line with a country-wide movement to reduce the number of medical colleges and advance the standard of those that remain. It has perhaps not been generally recognized that six institutions for the training of doctors are really more than Philadelphia's share, and that the competition for students has not been a healthy one. There has been a division of energy and resources and all the schools have suffered. The concentration of the strength of three of these rivals into one large and admirably equipped institution cannot fail to be of the greatest benefit to the city as a centre of medical education.

The plan has for its fundamental features the adoption of the elective system in effect at Vienna and Oxford, which permits students to decide whose lectures they shall attend on any subject during the term, and the establishment of a post-graduate school at the University to perpetuate the name of the Medico-Chirurgical College. The Jefferson Medical College and University Medical School form a union on a basis of exact equality whereby both institutions and the medical world will, it is declared, be accorded distinct advantages. The united schools will be known as The Medical School of the University of Pennsylvania and the Jefferson Medical College of Philadelphia. The elective system, which is made effective in pursuing studies under the plan, is declared to represent the biggest step looking toward the advancement of the study of medicine that has been made in this country, largely because of its flexibility. It is pointed out that under the system of operation examinations will be held by a commission and the standing of students determined in units, which in effect will put upon the professors the burden of producing results, and will influence higher standards, at the same time giving wider range of opportunity for individual progress. One of the most commendable features of the consolidation is that by which Medico-Chirurgical College, under University control, will be set apart for post-graduate and research work. This is a department in which the divided schools have hitherto been lacking. With a new hospital to replace that which stands on the line of the Parkway, unrivalled opportunities will be afforded for advanced students in this branch of medical training.

The address of Dr. W. W. Keen at the recent Commencement of Jefferson Medical College is deserving of very careful reading by all who are interested in medical education. The distinguished and venerable surgeon, who graduated from Jefferson fifty-four years ago, used his lancet mercilessly in an effort to arouse the medical men and the business men of the city to unite in restoring Philadelphia to her former place of undisputed leadership in medical affairs.

Discussing the union between the Jefferson Medical College and the University of Pennsylvania Medical School, Dr. Keen denied emphatically the argument that the merger would strangle competition between Philadelphia's various medical schools. He insisted that the " real " competition was not between any of the Philadelphia institutions, but that it is " a competition between Philadelphia on the one side, and the schools in Boston, New York, Baltimore, Chicago, St. Louis, and elsewhere on the other." " It is time," said he, " that some one in Philadelphia should speak out boldly and plainly, even at the risk of adverse criticism. My age, my long service as a teacher, my present detachment from active teaching and determination of policy, would seem to justify my undertaking this frankly unwelcome task." Dr. Keen then went on to show that Philadelphia has fallen far behind other cities named in the comparative rank of its medical schools. He asserted that this decline was due neither to the superior advantages offered by the faculties of schools in other cities, nor to the professional ability of their graduates. Philadelphia's teachers and Philadelphia's medical graduates were just as good as those of any other city, he maintained, citing a long list of distinguished physicians in support of his claim. But in two other respects, he asserted, the number of students and the financial resources of the schools, Philadelphia had fallen lamentably behind other cities.

"In respect to the number of students," he said, "Jefferson is at the very top. In spite of the enormous decrease in the total number of students in the entire United States in the last ten years—amounting to a decrease of forty per cent. or more—and of the increased requirements for admission which the Jefferson has instituted in the session of 1914–15, the Jefferson registered 556 students, the largest number in any American medical school. The union with the University of Pennsylvania will, therefore, bring together the largest and the oldest medical schools in the United States. The next largest school (in Chicago) had 487, including thirty-five women students; the third (New York) had 381; the fourth (New York), 364; the fifth (Baltimore), 361, including thirty-one women; the sixth (Boston), 319; the next the University of Pennsylvania, 276. All the others registered much smaller numbers.

"But when we take a still broader view and compare the relative position of Philadelphia as a medical centre, including all its schools in comparison with all those in the five other principal medical centres just named, the result is far from flattering to Philadelphia. In 1846, seventy years ago, Philadelphia in its three schools had 915 students, and the other five cities had 978 students. Chicago had not then a single student.

"In 1855, sixty-one years ago, Philadelphia's four schools had 1189 students and the other five cities 959. Chicago then had seventy students. In 1903, thirteen years ago, when the total number of students in the United States reached its maximum (27,615), Philadelphia had 2139 students and the other five cities 8782. From the large percentages at the earlier dates Philadelphia had fallen to only one-fourth of the total number in the other five cities. Chicago had risen to 2476 and New York to 2039, the latter within one hundred of our total number (2139), while Chicago had over 300 more than Philadelphia. In 1915, when the number had fallen to 14,891 students, Philadelphia had 1267, while the other five cities had 6112, giving us one-fifth of the total number in the other five cities. Chicago had 2093 and New York 2041, each exceeding the number in Philadelphia by about 800 students. The contrast between the financial resources of Philadelphia medical schools and those of other American medical centres is a sad record of parsimony here and lavish generosity elsewhere. As nearly as I can estimate, not including state appropriations nor gifts prior to 1910, though these were many and large, the gifts to medical schools and their hospitals in Boston aggregate over $6,500,000. This includes the new Peter Bent Brigham Hospital, but not the splendid new buildings of the Medical School. The New York Schools, excluding Columbia, have received about $8,000,000, while Columbia has an ambitious plan for union with the Presbyterian Hospital. This alone will involve a total expenditure of $16,000,000. Part of this has already been pledged. The rest will follow. The Baltimore schools have received $3,500,000 in gifts which have been published. Other large sums have been paid since and large future plans are in contemplation. In Chicago over $7,000,000 has been given. Very ambitious plans are being considered there also. In St. Louis the gifts to Washington University amount to between $7,000,000 and $8,000,000. Besides this, it has the residuary legatee of two estates, running into the millions. The Rockefeller Institute also in New York has received $12,500,000. Our Philadelphia medical institutions in the same six years have received a little over $4,000,000. True, this in itself is a large sum, but in comparison with the gifts I have just cited, it is wholly inadequate.

"To place Philadelphia in the position she so long occupied we shall run a losing race unless our citizens are aroused by my figures. They must think in millions instead of thousands. They must be not only proud of their heritage, but anxious to see our ancient city restored to the front rank. Civic pride which has been such a magnificent asset to St. Louis—a much smaller city than Philadelphia—should stir the hearts and loosen the purse-strings of our merchants, manufacturers and capitalists. Medical 'Philadelphia To-day,' inadequate as it is, we have with us; Medical 'Philadelphia To-morrow,' we must realize by combined effort, 'a long pull, a strong pull, and a pull all together.' Herein lies the value of combination of our medical schools and the utilization of all our medical resources. The union of the largest school and the oldest school is, in my judgment, the first and most important step, but far, far from the last. The cooperation of our active state and county medical societies, of the efficient Departments of Health, of the state and city, and, above all, the loyalty and energetic assistance of the whole profession must be mobilized. We should also enlist the energetic City Club and the Chamber of Commerce, not so much for their direct financial help as for their moral support and their influence in creating a sympathetic public opinion."

THE PHILADELPHIA COLLEGE OF PHARMACY.

NINETY-FIFTH ANNUAL COMMENCEMENT.

The exercises of Commencement in the Philadelphia College of Pharmacy began with Baccalaureate services at the Church of St. Luke and the Epiphany on Sunday, June 4. The sermon was delivered by Rev. Dr. David M. Steele. The Professors' Banquet to the graduating class was held in the College auditorium on Monday evening, June 5. Alumni Day was Tuesday, June 6. The annual meeting was held in the morning, followed by class day exercises in the afternoon and a reunion banquet at the Hotel Adelphia in the evening.

The Commencement exercises were held on Wednesday evening, June 7, at the American Academy of Music, when the diplomas and prizes were awarded to the members of the graduating class. The opening prayer was made by Rev. Herman S. Cook, and an address was delivered by Rev. John G. Wilson, D.D. The degrees were conferred by President Howard B. French upon the following.

The following are the names of those receiving the degree of Doctor in Pharmacy (P.D.), together with the subjects of their graduating theses:

Name	Thesis	
Alff, Rudolph Eric	Bacteriology as an Asset to the Pharmacist	Wisconsin
Ankerbrand, Walter Frank	American Ginseng	Pennsylvania
Beecher, Lew Wallace	Photographic Supplies, A Valuable Adjunct to Pharmacy	Pennsylvania
Belles, Arthur Hartman	Ipecacuanha	Pennsylvania
Bernstein, Miss Ada Malvina	Italian Drug Store in an American City	Pennsylvania

Name	Thesis	
Blanco, Ramon Mas	Cork	Cuba
Blaustein, Louis Nathan	Bees Wax	Pennsylvania
Blum, Charles Julius	Extraction of Asparagin from Althaea	Pennsylvania
Bongiovanni, Joseph Nathaniel	Pepsin	Italy
Bosserman, Charles	Manna	Pennsylvania
Brendle, Lester Yoder	Urinalysis	Pennsylvania
Buoymaster, Paul	Limestone and Lime	Pennsylvania
Carn, Fred LeRoy	Embalming and Embalming Fluids	Pennsylvania
Cash, Artemus Bogan	Bile and the Bile Salts	No. Carolina
Collins, John Edward	Brass	Pennsylvania
Davis, Ellerslie Wallace	Castor-Jell	Pennsylvania
Dawe, William John	Limestone	Pennsylvania
Depew, Samuel Harry, Jr.	Liquefaction of Gases	Pennsylvania
Dilatush, Owen Philip Eaches	The Pineal Gland	New Jersey
Durand, Chalmer John	Estimation of Sulphur in Pyrites	Pennsylvania
Eisman, Charles Kolman	Hamamelis	Pennsylvania
Escanaverino, Miss Louisa Lutgarda	Anacardium Occidentale	Cuba
Escanaverino, Miss Maria Dolores	Theobroma Cacao	Cuba
Ferko, Joseph Aloysius	Vanilla and Its Extract	Pennsylvania
Fitzkee, Adam Hastings	Disinfectants and Disinfection	Pennsylvania
Gilfillan, James Walls, Jr.	Emetine	Maine
Goldblum, Adolph Addie	Peroxide of Hydrogen	Pennsylvania
Good, Jacob Edison	Tooth Powders	Pennsylvania
Gottshall, Earl Stouffer	Oleum Arachidis	Pennsylvania
Graham, John Russell	Liquor Antisepticus	Pennsylvania
Green, Raymond	Tinctura Iodi	Pennsylvania
Greenleaf, Harry Raymond	The Cohesion Figures of True and Synthetic Volatile Oils	Pennsylvania
Guarini, Joseph Raymond	Nitric Acid	Pennsylvania
Guest, Warren Rogers	The Manufacture of Gun Powder	New Jersey
Gunn, John Jay	Household Disinfection	Pennsylvania
Heiges, George Leonard	Glass, Ancient and Modern	Pennsylvania
Heinle, Charles Jacob, P. C.	Paper	Pennsylvania
Hendrie, William	Acetylene	Pennsylvania
Hill, Clayton Brooks	Paper Manufacture	Pennsylvania
Hirzel, George Edgar	Emetine	Pennsylvania
Hughes, Edward James	Colloids and Colloidal Solutions	Pennsylvania
Ibach, William Henry, Jr.	Cellulose and Its Uses	Pennsylvania
James, Rienzi	Soaps	Pennsylvania
Karnauskas, Miss Agatha	Store Service	New York
Keefer, Norman David	Colloidal Suspensoids	Pennsylvania
Keely, Robert Russell	The Harrison Act	Pennsylvania
Kindt, Samuel Peter	Cork, Its Origin and Uses	Pennsylvania

Name	Thesis	
Korncavitz, Frank Stanley	Liquor Picis Carbonis	Pennsylvania
Kurtz, John Rabold	Ammonium Carbonate	Pennsylvania
Lasley, Matthew Ivey	Sodium Bromide	No. Carolina
Lax, Isadore	Acidum Hydrochloricum and Acidum Hydrochloricum Dilutum	Pennsylvania
LeBar, John Amzi	Dialysis and Diolyzed Iron	Pennsylvania
Lehr, Irvin Elias	Pyrethrum	Pennsylvania
Lerner, Albert	Cacodylic Acid	Pennsylvania
Levy, Robert Allen, P. C.	The Venereal Diseases and Their Relation to Public Health	Pennsylvania
Lindenbaum, Isadore Joseph	Monobasic Sodium Phosphate	Pennsylvania
Lischer, Henry	Action of Free Iodine on the Upper Air Passages	Pennsylvania
Lohrman, Leroy O.	Coca	Pennsylvania
Lounsbury, Harry	Creosote Water	New Jersey
McAleer, Harold	Insecticides and Fungicides	New Jersey
McGinnis, John Frederick	Glycyrrhiza	Pennsylvania
Mallard, Oscar Paul	Acidum Hydrochloricum	No. Carolina
Martin, John Albert	Citric Acid by Fermentation	Colorado
Miller, Clark McCord	The Efficiency of Label Pastes	Pennsylvania
Miller, Edward Paul	Enteric Pills and Capsules	Pennsylvania
Miller, Robert Jacob	Sterilization of Tooth Brushes and Eye Droppers	Pennsylvania
Mouer, Clayton Henry	Magma Magnesiæ	Pennsylvania
O'Neill, Vincent Patrick	Drug Store Advertising	Pennsylvania
Packer, Emmett Edward	Citrus Trifoliata	Pennsylvania
Pascoe, John Gwinner	Glycerin	Pennsylvania
Paul, Preston Arlington	The Making of Rubber Goods	Pennsylvania
Perrine, Norman, P. C.	Crystallography	New Jersey
Peters, Howard Lewis	Modern Hard Soaps	Pennsylvania
Piekarski, Joseph William	Lime Water U. S. P.	Pennsylvania
Porr, John Wolf	Colleges of Pharmacy in the United States	Pennsylvania
Resser, Alpheus William	The Assay of Lime Water	Pennsylvania
Rhoads, Paul Edward	Magma Magnesiæ	Pennsylvania
Rodgers, Raymond H., P. C.	Fluidglycerates	Pennsylvania
Rovner, Arthur	Essence of Peppermint	New Jersey
Ryan, Thomas A., P. C.	Adeps Bezoinatus	Pennsylvania
Sanchez, Felix Enrique Mestril	Tobacco	Cuba
Sarlo, Joseph	Vanilla	Pennsylvania
Scheible, Edmund Morris	Solubility of Sulphur in Carbon Disulphide	Pennsylvania
Schlegel, Lawrence Brown	Phenolphthalein and Its Uses	Pennsylvania
Searight, John Woodburn	Ergot and Its Uses	Pennsylvania
Seitzinger, Robert Lawrence	Saturated Solutions	Pennsylvania

Name	Thesis	
Selim, Aly	Carcadiah or Abutilon	Egypt
Shaffer, James Walter	Hydrastis Canadensis	Pennsylvania
Showers, Guy Warren	Chinese Wood-Oil	Pennsylvania
Smith, Dole McClure	Prescription Dispensing	Ohio
Smith, William George	Salol Coating of Pills	Pennsylvania
Sonne, Ernest Harley	Iodine Petroxolin	Pennsylvania
Steel, Max Wensel	Acacia and the Official Mucilage	Pennsylvania
Stein, Abraham Mordecai	Calamus	New York
Steltzer, Lewis Gustave	Thermalite	Pennsylvania
Stokely, Harvey Venton	The Manufacture of White Lead	Ohio
Straup, John Wesley	Solidified Alcohol	Pennsylvania
Stuart, James Earle	An Intestinal Lubricant	Pennsylvania
Suter, Lester Ambrose	Potassii Bitartras	Pennsylvania
Tagg, Norman Harvey	Drug Store Cleanliness	Pennsylvania
Thornton, Harry Carl	Liquor Alumni Acetatis Crudus "Burrow's Solution"	Pennsylvania
Togans, James Albert, Ph.G.	The Germicidal Power of Emetine and the Alcresta Ipecac	Pennsylvania
Tucker, Oscar George	Rheum	Pennsylvania
Vandegrift, Harry Umsted	Essence of Pepsin	Pennsylvania
Wallace, William Alexander	Plant Hairs and Their Importance	Pennsylvania
Weatherford, Boyd	Ichthyol and Its Substitution Compounds	Kentucky
Webb, Harry Cornelius	Herbs	Pennsylvania
Weeks, Kenneth	The Assay of Milk of Magnesia	New Jersey
Weidler, Walter Franklin	Liquor Plumbi Subacetatis	Pennsylvania
Weidner, Elmer Milton	The Assay of Aromatic Spirit of Ammonia	Pennsylvania
Wells, Walter Neff	Show Card Writing and Window Decoration	New Jersey
Werkheiser, Harold E., P. C.	Paraffin	Pennsylvania
Werntz, Cecil Semmons	Drug Store Side Lines	Pennsylvania
Wexlar, Benjamin J.	Cacao Butter and Chocolate	Pennsylvania
Whelan, Walter	Turpentine	Wales
White, Hobart Pryde	Hyoscyamus	Pennsylvania
Whitesell, Elwood E.	The Extraction and Analysis of Molasses from Cane Sugar	Pennsylvania
Weiser, John William, Ph.G.	Own Preparation Plan	New York
Willard, Miss Elizabeth May	Father Time and Pharmacy	New Jersey
Wolf, Clarence Melvin	Citric Acid and Citrates	Pennsylvania

The following are the names of those graduates who received the degree of Pharmaceutical Chemist (P.C.), together with the subject of their theses:

Name	Thesis	
Cravens, John Coldsmith, Jr.	Castor-Jell	Pennsylvania
Ehman, Karl Francis	Glycyrrhizin	Pennsylvania
Grandy, Seth Parker	Influenza	Pennsylvania
Helweg, Lawrence William	Cocoanut Oil	New Jersey
Kalusdian, Vartan Mardiros	Perfume and Its Manufacture	Armenia
King, Jacob Harris	Filter Paper	Pennsylvania
Lenninger, Clifford	Tincture of Strophanthus	Wyoming
Luther, Maurice Augustine	Mescal	Pennsylvania
McGarrity, Miss Florence Raphael M.	Advertising	Pennsylvania
Stikarofsky, Albin	Chelidonium	Austria
Waters, Cyrus Albert	Syrupus Ferri Iodidi	Pennsylvania

Certificates of Proficiency in chemistry were awarded the following:

Herbert Calvin Brightbill, Sylvan L. Foster, P.D., Louis J. Kleinfeld, Howard J. Koch, P.D., Chester L. Masser, John J. Over, Robert Rowen, Max M. Waxman, and George W. Tucker.

A Certificate of Proficiency in the Food and Drug Course was awarded to Louis G. Linford, Ph.G.

Certificates in Bacteriology were awarded to the following:

Miss Silvia C. Alacan, P.D., Rudolph Eric Alff, Ramon Mas Blanco, Charles Bosserman, Parker B. Creep, P.D., Owen Philip Eaches Dilatush, Andrew C. Fayko, Seth Parker Grandy, Vincent Allen Heinle, Joseph A. Hilton, Leo J. McCorriston, Chester Luther Masser, Robert Rowen, Felix Enrique Mestril Sanchez, Jr., Mrs. Mignon Gray Simonin, Dole McClure Smith, Miss Maud Sollenberger, P.D., Mrs. Sadie Swyers, Boyd Weatherford, John W. Wieser, and David B. Witman, P.D.

A Certificate in Analysis of Agricultural Products was awarded to Carlos Marie Aguiar, P.D.

Award of Prizes.

Presentation of the Martin Cup to the Graduating Class of 1916.

Presentation of "The Graduate 1913" Cup to the Ph.G. Class of 1917.

The grade of Distinguished was attained by Edward J. Hughes and William A. Wallace.

The grade of Meritorious was merited by: Rudolph E. Alff, Luisa L. Escanaverino, Maria D. Escanaverino, Norman D. Keefer, John A. Martin, Ernest H. Sonne, and Albin Stikarofsky.

The William B. Webb Memorial Prize, a gold medal and certificate, offered for the highest general average in the branches of Committee, Operative Pharmacy, and Specimens, was awarded to Edward J. Hughes, the presentation being made by Dr. Adolph W. Miller. The following graduates received honorable mention in connection therewith: Ernest H. Sonne, William A. Wallace, and Elizabeth M. Willard.

The Chemistry Prize, $25, offered by Prof. Samuel P. Sadtler, for knowledge of Quantitative Chemical Analysis, was awarded to Guy W. Showers.

The Materia Medica Prize, $25, offered by Prof. Clement B. Lowe, for the best examination in Materia Medica, and in recognition of Materia Medica Specimens with a meritorious thesis, was awarded to Luisa L. Escanaverino. The following graduates received honorable mention: Maria D. Escanaverino, Edward J. Hughes, Ernest H. Sonne, and William A. Wallace.

The Microscopical Research Prize, a compound microscope, offered by Prof. Henry Kraemer, for the most meritorious thesis involving original Microscopic work, was awarded to John A. Martin. The following graduates received honorable mention: Luisa L. Escanaverino, Maria D. Escanaverino, Felix E. Sanchez, Albin Stikarofsky, and William A. Wallace.

The Analytical Chemistry Prize, $25, offered by Prof. Frank X. Moerk, for the best work in Qualitative and Quantitative Analysis, was awarded to Maria D. Escanaverino. The following graduates received honorable mention in connection therewith: Luisa L. Escanaverino, and William A. Wallace.

The Operative Pharmacy Prize, $20 in gold, offered by Prof. Joseph P. Remington, for the best examination in Operative Pharmacy, was awarded to John W. Straup. The following students merited honorable mention: John E. Collins, Chalmer J. Durand, Adam H. Fitzkee, John R. Graham, Edward J. Hughes, Oscar P. Mallard, John A. Martin, John W. Porr, Albin Stikarofsky, Lester A. Suter, and William A. Wallace.

The Maisch Botany Prize, $20 in gold, offered by Mr. Joseph Jacobs, of Atlanta, Ga., for the best Herbarium Collection of Plants, was awarded to William A. Wallace, the presentation being made by George M. Beringer, chairman of the Board of Trustees.

The Mahlon N. Kline Theoretical Pharmacy Prize, a Troemner agate prescription balance, for the best examination in Theory and

Practice of Pharmacy, was awarded to William A. Wallace, the presentation being made by Clarence M. Kline. The following students merited honorable mention in connection with this prize: Rudolph E. Alff, Luisa L. Escanaverino, Maria D. Escanaverino, John R. Graham, Edward J. Hughes, Norman D. Keefer, and John A. Martin.

The Commercial Pharmacy Prize, $20 in gold, offered by Prof. Joseph P. Remington to the graduate who passed the best examination in Commercial Pharmacy at the final examination for the degree, was awarded to John R. Graham, the presentation being made by Prof. Cook. The following students received honorable mention: Joseph A. Ferko, Edward J. Hughes, Maurice A. Luther, Howard L. Peters, Ernest H. Sonne, Albin Stikarofsky, William A. Wallace, Elizabeth M. Willard, and Clarence M. Wolf.

The Instructors' Prize, $20, offered by the instructors of the College for the highest term average in the branches of Pharmacy, Chemistry, and Materia Medica, was awarded to Maria D. Escanaverino, the presentation being made by Professor Stroup. The following students received honorable mention: Luisa L. Escanaverino, Edward J. Hughes, William A. Wallace, and Elmer M. Weidner.

The Pharmacy Review Prize, one year's membership in the American Pharmaceutical Association, offered by Prof. Charles H. LaWall, for the best term work in Theory and Practice of Pharmacy, was awarded to William A. Wallace. The following received honorable mention: Rudolph E. Alff, Maria D. Escanaverino, Joseph A. Ferko, Edward J. Hughes, and John R. Kurtz.

The Kappa Psi Fraternity Prize, a gold medal, offered by the Eta Chapter of the Kappa Psi Fraternity to the graduate making the highest general average during the senior year at the College, was awarded to Edward J. Hughes, the presentation being made by Prof. Roddy. The following students merited honorable mention: Rudolph E. Alff, Maria D. Escanaverino, and William A. Wallace.

The Special Lecture Report Prize, $10 in gold, awarded for the best written reports of the series of special lectures held under the auspices of the College, session 1915–1916, was awarded to Albin Stikarofsky, the presentation being made by Mr. Samuel C. Henry.

The Col. H. C. Demming Prize, a $50 Oriental ruby, for the best and most satisfactory advancement during the College year 1915–1916, was awarded to Max Wensel Steel, the presentation being made by Prof. Remington.

FIFTIETH ANNIVERSARY ALUMNI CELEBRATION, P. C. P.

At a recent meeting of the committees representing the Board of Trustees of the College and the Alumni Association, it was decided that the 50th Anniversary Alumni Celebration of the Philadelphia College of Pharmacy take place at the time of the A. Ph. A. meeting next September. There will be two separate functions.

1. The Fiftieth Anniversary Alumni Reunion and Testimonial Dinner to Professor Sadtler. This function will be held at Atlantic City during the week beginning September 4.

2. An exhibition at the Philadelphia College of Pharmacy illustrating the progress in pharmacy during the past fifty years.

These events promise to be of great importance and will interest not only the Alumni of the Philadelphia College of Pharmacy but those pharmacists and their friends who will attend the Atlantic City meeting of the American Pharmaceutical Association. The Reunion Dinner, which will take the form of a tribute to Professor Sadtler, who is retiring after more than thirty-five years of active service in the Philadelphia College of Pharmacy, will be attended by America's foremost pharmacists and chemists.

The Historical Exhibition will be held at the Philadelphia College of Pharmacy, and will be open from August 28 until September 10. The spacious Museum will be entirely devoted to a college exhibit of apparatus, specimens, books, and portraits. The lecture-rooms and the halls will contain the exhibits of manufacturers and others. It is anticipated that there will be a large display of rare chemicals and preparations, apparatus, fixtures, old drugs, curios, books, diplomas, certificates, medals, manuscripts, letters, lecture tickets and portraits of distinguished pharmacists. All who can in any way contribute to the success of this exhibition are earnestly requested to loan such material of this kind as they may have, which will be protected with duplicate checks so that there will be no confusion or loss on the part of those who will kindly loan the material.

As the time is relatively short for the final arrangements of the exhibition, it is very much desired that those wishing to contribute to the historical exhibit will promptly communicate with the committee.

Howard B. French,
Chairman.

Henry Kraemer,
Secretary.

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CITRIC ACID BY FERMENTATION.

By JOHN ALBERT MARTIN, P.D.

The replacement of natural products by artificially prepared substances is, with little doubt, one of the most interesting subjects to the scientist of to-day. This substitution has been the growing tendency within the last ten years, and nearly every one is aware of the wonderful advancements which have been made along these lines, especially in the science of chemistry—an example being in the commercial synthesis of gum camphor and the many synthetic products from coal-tar compounds, which have proved of such value and importance. Until recent years the artificial production of chemical substances has been accomplished either by the synthesis or analysis of other chemicals. But the investigations by some of our later scientists of fermentation and enzyme action have brought to light many of the heretofore unknown facts and the realization of the importance and possibilities of this action. As yet little commercial utilization of this knowledge has been attempted, although as far back as 1884, in Germany, it was found that citric acid, resembling the natural product in all its properties, could be formed, under certain conditions, by the fermentative action of certain microörganisms upon suitable carbohydrates. To our knowledge this was never made a commercial possibility in this country, and upon this consideration the following work is based. In selecting this subject for a thesis it is with the realization that it is one which would be considered by those of knowledge on fermentative action as quite an undertaking; however, with the facilities of the present time for obtaining the complete data and the literature in the many scientific journals on the recent results of experimentation in fermentation the results are encouraging.

The subject of citric acid production will be considered by first giving the present source of the acid, with a brief outline of its production and manufacture. Following this will be given its possible synthesis and its production by fermentation. The major part of this thesis consists of original work with the aid of Professor Kraemer, and takes in the period of experimentation from September, 1915, to April, 1916.

Citric acid is a well-known substance in many industries and sciences, especially in that of Pharmacy, in which it is one of the official acids in the United States Pharmacopœia and enters thirteen official preparations. It occurs naturally in the juices of many plants associated with other acids, especially in the fruits of the lemon, lime, bergamot, gooseberry, and in several bulbs and tubers. It was first obtained in the solid state by Karl Wilhelm Scheele in 1784 from the juice of the lemon. Citric acid occurs in colorless, translucent right rhombic prisms; odorless, having an agreeable purely acid taste, efflorescent in warm air and deliquescent when exposed to moist air. Citric acid was brought to the attention of the pharmacist in the early part of 1915 by the fluctuation in price, due mostly to the present European war and the destruction of the lemon groves by volcanoes and earthquakes which occurred recently in the southern part of Europe. This war, proving of such endurance and thereby affecting the transportation from all the foreign countries, has advanced the price of the acid over a hundred per cent.

CITRUS INDUSTRY.

Citric acid is manufactured from the juice of the fruit of the following three species: *Citrus medica* (cultivated lemon), *Citrus Bergamia* (bergamot), and *Citrus Limetta* (wild lemon). The cultivated lemon is the main source and is grown most extensively in Sicily, Calabria, and, to a considerable extent, in Spain. Under favorable conditions a good lemon plant should yield one thousand lemons a year. The refuse lemons, which form about one-fourth the crop, are used in the manufacture of citric acid, as they cost only half as much as the picked fruit. A skilled operator can peel more than four thousand lemons a day, the peel being collected separately for the preparation of the volatile oil, which is an important branch of this industry.

The preparation of the juice for shipment is comparatively a simple matter. The presence of glucose with certain extractive gummy substances and inorganic salts in the fresh juice renders it impossible to crystallize the citric acid by concentrating the juice, even when all the glucose is transformed into alcohol. So, even at the present time, the citric acid is separated by Scheele's costly process, by which it is first converted into calcium citrate. The high price of fuel has prevented the establishment of the citric acid industry in Sicily, and the preparation of the acid has been monopolized for a long time by England, Germany, and the United States. These countries receive the raw material from Sicily in three forms: first, as lemons packed in barrels containing sea-water; second, as concentrated juice called "Argo Cotto," but mostly as calcium citrate. The juice does not keep well and is usually concentrated at once in open pans with direct heat until the product is a blackish decoction. The boiling-hot decoction is passed through a cloth and collected in casks for transportation.

Treatment of the Juice.—In the large modern factories, where the juice of the lemon is employed, the concentrated liquid is first clarified from its extractive matter by allowing it to ferment. It is then filtered and brought to the boiling temperature and neutralized with dense milk of lime or with powdered calcium carbonate. The cakes of calcium citrate thus formed are taken from the filter presses and mixed with water. The lime of the calcium citrate is neutralized with dilute sulphuric acid, liberating free citric acid and precipitating calcium sulphate.

Concentration was formerly carried out in lead-lined wooden vessels by rapid evaporation, and at 46° C. almost all the calcium sulphate is precipitated. There are three modern factories in this country which use the vacuum apparatus as in the sugar industry. The clear liquid is then siphoned into a vessel beneath and the concentration continued. After decolorizing the liquid by passing through charcoal, the liquid is finally transferred to wooden vessels and crystallization repeated until colorless, translucent crystals are obtained.

Citric Acid by Synthesis.—The acid has been prepared synthetically by Grimaux & Adam. A saturated solution of dichloracetonic acid was neutralized with sodium carbonate and heated with two molecules of potassium cyanide. The resulting solution of dicyanoacetates was saturated with hydrochloric acid gas and heated on a water-bath for fifteen hours. The citric acid was then separated as calcium citrate by neutralization with milk of lime.

Another synthesis has been effected by Lawrence, who obtained ethyl citrate by heating together ethyl bromacetate and ethyl ozalyl acetate in the presence of zinc. Both, however, are impracticable.

In considering the subject of citric acid by fermentation it is important to mention the recent theories on the action of ferments and the cause of fermentation in order to understand from which view the acid formation was studied.

The first two prominent theories accounting for the cause of fermentation were: one, in which the action was regarded as a chemical change of the substance itself without the assistance of any organic body; the other, that fermentation was due to the action of an organism. The latter was proved to be correct and was studied thoroughly by a number of prominent scientists. It was found that for fermentation there must be present a ferment, organic matter, proper temperature, and water to allow free molecular motion. Noted bacteriologists and chemists such as Turpen held that the presence of the fungi caused a breaking down of the sugar to carbon dioxide and alcohol; while Liebig believed the transformation of the sugar was caused by the action of substances, later determined to be enzymes, contained in the fungus itself.

Pasteur, in 1812, showed that certain ferments live at the expense of the oxygen of the air and can decompose sugar into carbon dioxide and water, but when they are immersed in the saccharine fluids and no longer able to obtain oxygen from the air they would extract it from the sugar, changing it into carbon dioxide and alcohol. Liebig's theory, confirmed by the experiments of Pasteur, led up to the present theory,—that fermentation is caused by the action of substances (enzymes) which are produced by the changing (breaking down) of the cell substances in the growth of the plant, the true ferment in a broad sense being a by-product of the organism's growth.

The presence of enzymes was experimentally proved by Büchner in 1900, who succeeded in showing that some of the fermentations in the past which could only be induced by living organisms could also be effected by using the extract of these organisms obtained by forcing it under great pressure through special unglazed porcelain filters, the cells being previously ground with quartz sand to rupture the cell wall. The enzyme thus extracted possesses the same action as the growing yeast cell.

A distinction must be made between the two classes of ferments, organized and unorganized. The ferment considered in this work is produced by one of the fungi (Hyphomycetes) of the organized group and resembles the common blue mould found so freely on decaying vegetable matter.

CITRIC ACID BY FERMENTATION.

In the year 1892 Carl Wehmer, a Hanoverian botanist, while working with alcoholic fermentation, found citric acid in a fermenting sugar solution. After numerous experiments he proved this change was brought about by two separate species of moulds or filamentous fungi, named by him *Citromyces Pfefferianus* and *Citromyces glaber,* respectively.

These moulds were described as belonging to the Ascomycetes and resemble *Penicillium glaucum,* the blue mould which occurs so commonly on fruits and decaying proteids. The spores of the Citromyces are present in the atmosphere and the plant growth can be found on common fruits, such as the apple and pear.

Mucor piriformis, a filamentous fungi of the Zygomycetes group, was first discovered by Alfred Fischer and studied by Carl Wehmer, who showed that it forms comparatively large quantities of citric acid when light is admitted to cultures of the fungus grown in a suitable nutrient solution. The spores of this plant also occur in the atmosphere and were first found on decayed fruit.

From the above, it appears that three different species of fungi have been shown to produce citric acid, but that comparatively little work has been done by the authors to find the value of this formation, while up to the present time no attempt has been made in this country to find if this formation is of commercial value.

In the preparation of this work it was first necessary to secure the fungi described by the authors, and, as there had been no verified cultures of these species of fungi sent to this country, it was left to look for them as they occurred naturally. Pure cultures were obtained by following the usual method of sterilizing a piece of platinum wire by passing through a flame and, after becoming cool, touching the surface of the mould growth desired and, with the few spores adhering to the wire, inoculating the sterilized nutrient substance prepared. The culture was then labelled and allowed to stand exposed to light and an average temperature of 20° C., taking note of its appearance at different stages of growth.

A culture was obtained from the U. S. Department of Agriculture which was said to resemble the Citromyces in its acid production. This specimen was labelled No. 28.

Through the assistance of Professor Kraemer two cultures of *Mucor piriformis* were secured from the International Botanical Association, Amsterdam, Holland.

Of the total number of specimens taken, twelve distinctly different genera were selected to determine their acid-forming properties, including the verified culture of *Mucor piriformis,* the remaining thirty-one specimens being identified as various species of *Penicillium, Aspergillus,* and *Mucor.* The fermentative action of these three genera being well known, they were discarded.

These common moulds are readily distinguished microscopically, although with the naked eye they occur in many distinct and characteristic colors.

Aspergillus has seven common species, all of distinctly different color. (It can be seen from this that a number of the same genus can appear as entirely different plants.)

EXAMINATION OF SPECIMENS.

The time required to detect the growth with the naked eye was from three to seven days. After inoculation of the cultures, each specimen was examined at the first appearance of growth and at in-

TABLE I.

Observations of Specimens Growth on Solid Cultures.

Specimen number	Identification	First growth, days	COLOR			Reproduced by
			Fifth day	Ten days	Twenty days	
25	Mucor piriformis	2	Black	Black	Brown	Sporangia.
24	Mucor mucedo	2	Black	Black	Black	Sporangia.
33	Mucor racemosus	3	Black	Black	Brown	Sporangia.
31	Mucor ? *	3	White	Brown	Brown	Sporangia.
28	Citromyces	4	White	Pale green	Light brown	Conidia.
14	Citromyces	3	White	Dark green	Dark brown	Conidia.
19	Penicillium G.	2	Pale green	Dark green	Dark green	Conidia.
22	Penicillium ? *	2	Pale green	Dark green	Brown	Conidia.
30	Aspergillus N.	2	White	Black	Brown	Conidia.
21	Aspergillus A.	3	White	White	White	Conidia.
9	Aspergillus F.	4	White	Yellow	Brown	Conidia.
12	Aspergillus ?	3	White	Dark green	Dark green	Conidia.

* Identification of these fungi not determined.

tervals one or two days after. The notes on the following page were taken during two weeks' time. After having secured the pure cultures of these known species of fungi, the object was to find their fermentative power and production of acid, if any. To do this it was necessary to have a sterile liquid containing no harmful substances but those which would support the growth of the plant and a known quantity of sugar from which the acid may be formed.

The following nutritive solution was suggested by Professor Kraemer and used with success:

Ammonium phosphate, $(NH_4)_2HPO_3$	3.9	Gms.
Acid potassium phosphate, (K_2HPO_3)	1.05	Gms.
Magnesium sulphate, $MgSO_4$	.05	Gms.
Calcium nitrate, $Ca(NO_3)_2$	.05	Gms.
Dextrose	100	Cc.
Distilled water	1000	Cc.

Difficulty was had at first in the preparation of this solution, as the precipitate of magnesium ammonium phosphate was formed in the completed mixture, but this was overcome by dissolving the magnesium salt and the ammonium salt each in 500 Cc. of water. On then mixing these two dilute solutions no precipitate was formed, the remaining salts being finally added. One hundred cubic centimetres of this solution were placed in each one of twelve Erlenmeyer flasks and twelve disk-shape flasks, and the neck of each plugged lightly with cotton wool. These were then placed in a steam sterilizer and kept until perfect sterilization was obtained.

The now sterile liquid cultures were left standing at 20° C. for six days. The absence of living bacteria and fungi being assured, each was inoculated with one of the known specimens and labelled with number and date. The inoculating was done as in the preparation of the solid cultures, being careful to have the wire sterile and only the spores of the mould desired planted in the solution, as any contamination would make the attempt to find the acid-producing powers of the specimen useless. The cultures were allowed to stand at an average temperature of 20° C. exposed to light for ten days, it requiring that length of time for the surface of specimen No. 28 and No. 25 to become covered, the remaining requiring from six to eight days to reach their maximum growth. There being found no decisive change on examination of the solution after five days' standing, it was reasoned that on the average the growth reached its optimum in ten days and maximum in twenty days; the condition of the solution at this time was proper for determining the acid content. On the tenth day the solutions were filtered and 10 Cc. of each set aside for immediate titration. The flasks were sterilized and the identical procedure was carried out for the second time, but allowing the growth to continue for twenty days.

These solutions were also filtered and 10 Cc. of each titrated. The results of this work are given in Tables II and III.

TABLE II.

Acid Content in Solution After Ten Days' Standing, Using Empirical (V. S.) NaOHn/20 as Titre. (Blank Test—10 Cc. Nutrient Solution Req. 4.2 Cc. NaOH (V. S.).

Culture number	Amount taken	Burette reading	Amount required	Excess required	Acid recognized
	Cc.				
9	10	0– 4.2	4.2	0	....
12	10	4.2– 8.4	4.2	0	....
14	10	8.4–15.3	6.9	2.7	as $H_3C_6H_5O_7$.
19	10	15.3–19.5	4.2	0	....
21	10	19.5–24.2	4.7	0.5	?
22	10	24.2–28.4	4.2	0	....
25	10	28.4–32.6	4.2	0	....
28	10	32.6–48.4	15.8	11.6	as $H_3C_6H_5O_7$.
24	10	0– 4.2	4.2	0	....
30	10	4.2– 9.8	5.6	1.4	as $H_2C_2O_4$.
31	10	9.8–14	4.2	0	....
33	10	14 –18.2	4.2	0	....

TABLE III.

Acid Content in Solution After Twenty Days. Empirical V. S. NaOHn/20 as Titre Ph. Indic. Blank Test—10 Cc. Nutrient Solution Req. 4.2 Cc. NaOH (V. S.).

Culture number	Amount taken	Burette reading	Amount required	Excess required	Acid recognized
	Cc.				
9	10	0– 4.2	4.2	0	....
12	10	4.2– 8.4	4.2	0	....
14	10	8.4–18.3	9.9	5.7	as $H_3C_6H_5O_7$.
19	10	18.3–22.5	4.2	0	....
21	10	22.5–27.2	4.7	0.5	?
22	10	27.2–31.6	4.2	0	....
25	10	31.6–35.8	4.2	0	....
28	10	0–47.1	47.1	42.9	as $H_3C_6H_5O_7$.
24	10	0– 4.2	4.2	0	....
30	10	4.2–22.7	18.5	14.3	as $H_2C_2O_4$.
31	10	0– 4.2	4.2	0	....
33	10	4.2– 8.4	4.2	0	....

The result of this titration was to find only the quantity of acids formed corresponding to a known strength alkaline solution, as the presence of different complex acids through the action of the fungous growth and the nutrient salts which would be in the solution could not all be estimated as one definite acid. The fifth column of the table shows decided results, there being only four specimens which had formed acid. This eliminated all the remaining specimens, the work now being reduced to these four: Nos. 28, 14, 30, and 25.

The other specimens, being of no further interest as to acid production, were dropped. Identical results were found with the solutions in the flat-bottom flasks, showing that the excess of air in this case was of no consequence.

Three tests were used to detect the presence of citric acid, one by the use of calcium citrate, and two by color reactions which gave decided confirmative tests, both of these being given under " Chemistry " portion of this thesis.

Of the four specimens taken, Nos. 28 and 14 responded to the above test, both giving distinct reactions. This brings the number down to two, eliminating No. 25, *Mucor piriformis,* which was mentioned by La Far as having produced citric acid. The failure of this specimen to respond was probably due to unfavorable conditions of temperature and light (which were studied in detail to determine the plant's activity, but without results). No. 30, *Aspergillus nigrescens,* showed a strong reaction to oxalic acid tests. Repeated experiments were made with specimens Nos. 28 and 14 to determine any additional acid-forming properties, and in each case No. 28 was found to be far the more active, yielding nearly eighty per cent. more acid, although being of slower growth (and easily overgrown by No. 14). The whole remaining work and experiments were concentrated on this one species of Citromyces, studying its action under different conditions of temperature, in various culture flasks, and mainly its action on different nutrient solutions. It was found to be independent of light. The final object was to determine the maximum quantity of crystallized citric acid which could be produced by this plant, taking careful observation of the conditions required for this result. The above work is given under "Acid Production " by Specimen No. 28.

MICROSCOPICAL EXAMINATION OF SPECIMENS.

A detailed description of all the specimens used would be of little value, therefore the study of only the specimens producing acid are to be considered.

No. 28, secured from the United States Department of Agriculture, was found to closely resemble the Citromyces group, and was first examined macroscopically, with the following notes: The appearance of the plant on a solid culture the fourth day after inoculation was a white wool-like growth of spherical shape (with convex surface gradually spreading over the surface equally in all directions). The fifth day a pale-green color appeared at the centre, due to the production of spores, which rapidly covered the surface, this color remaining characteristic throughout the plant's growth, the maximum growth being from a week to fifteen days, according to the temperature, the optimum 25° C. The plant at this stage gradually dies, turning brown, but the spores retain their activity and readily germinate on fresh nutrient media. Gelatin media was liquefied after six days' growth and was found less satisfactory than agar media, which not only remained solid but was less prone to drying. The time for minimum and maximum growth is found in Table I. In liquid cultures, growth was much slower, the minimum time required for growth to appear being six days, and from twenty to thirty days for maximum growth, according to temperature.

In a liquid culture where air was excluded, there was no color produced, the growth remaining white and of uneven convex surface concentrated in spots. This shows that an excess of air is necessary for spore production, and this species is probably what Wehmer named *Citromyces tollensianus,* given in the *Journal of Society of Chemical Industry,* 1910, p. 37.

On allowing air to pass through cotton wool into the flask spores were produced after the second day. Under the microscope a slide made from the surface growth on solid culture showed a mycelium consisting of transparent, branched, and divided filaments which usually swell somewhat irregularly. From these filaments the conidiophores rise perpendicularly. They consist of an elongated cylinder, the end cell of which is soon arrested in its growth and forms a thorn-like summit (the cell immediately below throws out four or five opposite condiospores, rising up close to the end cell, forming a fan-shaped organ).

At the summit of each of these branches is an elongation in the plant's growth by which the upper extremity is constricted from the main plant, forming a new independent organ or spores. The spore formation, which is continuous throughout the growth of the plants, shows a chain of spores remaining attached to each other by a remaining thread, which is easily broken by the force of a draft of air or in coming in contact with some moving object.

In liquid media the mycelium ramifies in all directions, producing pairs of thick, short branches which entwine themselves about each other, forming in groups of loose masses with the formation of perithicea, an organ of reproduction which consists in this case of a spherical interwoven mass of mycelia threads having the property of producing asci. These organs are very resistant to sterilization, due to the protective coat of mycelia.

Upon examination, No. 14 proved to be similar to No. 28. The method of reproduction of the plant was exactly the same, while the growth was nearly twice as rapid. The formation of perithicea also occurred in liquid cultures, but not to such an extent as with specimen No. 28. The surface color of the plant is a much darker shade of green and easily distinguished, the study of the conidiophore showing a larger and more heavily branched formation and, consequently, more spores, which accounts for its more rapid growth.

The presence of such large numbers of spores made it very difficult to examine the structure of the conidiophore, and required the examination of the specimen to be made at an early stage of the plant's growth.

No. 25 (*Mucor piriformis*), although not giving results in its production of acid, was of very great interest, it being easily distinguished on account of its size and its clear method of reproduction by both sporangia and perithicea. The macroscopical appearance of the plant at the beginning of its growth is a white woolly growth from two to three millimetres high, spreading over the surface of the media gradually. After two days the growth, now from eight to ten millimetres in height, turns black on the surface, due to the formation of spore-bearing sporangia. The plant then rapidly covers the surface of the medium through the spreading of the spores. The first formation of the mycelia in liquid culture is followed by perithicea, which later, as in solid culture, produces a conidiophore (upright stem) bearing, as described, a sporangium or head, covering a pear-shaped columella between which the spores are contained. As the growth proceeds, the columella enlarges, absorbing moisture, and ramifies upwards, breaking the film covering the head and freeing the spores. This reproduction takes from twelve to fifteen days, and after this time the plant dies, turning to a brown color.

No. 31 (*Aspergillus nigrescens*) also proved of interest in its manner of reproduction, but was more like Citromyces in its spore-bearing organ. A short description is given of this plant, owing to its production of oxalic acid. The conidiophore supports numerous rod-shaped branches, each terminating in a spherical spore. *Aspergillus nigrescens* can be mistaken macroscopically for *Mucor* by its first appearance as a white woolly growth, later turning black, due to the spore formation.

No. 19 (*Penicillium glaucum*) was studied on account of its free occurrence and its readiness to contaminate pure cultures. It was found to be one of the most difficult to eliminate in the preparation of cultures, and would probably be the hardest thing to avoid in citric acid fermentation on a large scale, due to the sturdy character of the plant and its ability to outgrow any other fungus present. Macroscopically it is easily distinguished from specimen No. 28 by the marked difference in color of the two organisms, *Penicillium* being a dark green to a blue, while No. 28 is of a distinct pale green. It was quite difficult, however, to distinguish it in color from No. 14, which is but slightly lighter green than *Penicillium*. Microscopically the plants were comparatively easily recognized, *Penicillium* being much larger and more heavily branched. The reproduction is identical.

In the study of these fungi they were also grown upon Rawlin's nutritive solution. This was used chiefly in the propagation of cultures.

RAWLIN'S NUTRITIVE SOLUTION.

	Gm.
Distilled water	1500.00
Cane sugar	70.00
Tartaric acid	4.00
Ammonium nitrate	4.00
Ammonium phosphate	.60
Potassium carbonate	.60
Magnesium carbonate	.40
Ammonium sulphate	.25
Zinc sulphate	.07
Ferrous sulphate	.07
Potassium sulphate	.07

In the preparation of this solution, on adding the tartaric acid a precipitate is formed of ammonium magnesium phosphate, which, on substituting with citric acid, forms the double soluble salt of ammonium magnesium citrate, giving a clear solution. Two per cent.

of agar-agar is added and allowed to boil until all the agar is dissolved. Agar was found preferable to gelatin for making solid media, as the surface of the gelatin culture after exposure to air for a time would become too hard to allow the growth of the plant. The sugar is not added until this point, for if it is kept in contact with the heated acid too long it is caramelized, giving the solution a dark-brown color. The completed mixture was then placed in six-inch test-tubes about one-fourth full and carefully plugged with non-absorbent cotton, allowing the free passage of air, but obstructing the entrance of any contaminating substance. The cultures are sterilized at 100° C. for thirty minutes. This was repeated for three consecutive days and was finally free of all bacteria or plant life and ready for the reception of the mould spores.

Twelve other formulas were prepared, increasing or decreasing the amount of each ingredient, with the following results: The growth of the plant was not dependent on the presence of the nutrient salts, as the growth would proceed on the sugar alone, however, very slowly, it taking about twice the time without the nutrient salts as with them. With the omission of a portion of the citric acid the growth was comparatively slow to start, but would increase rapidly after germination began. The omission of the ammonium salts had a decided effect of retarding the growth, showing both the nitrogen and phosphorus were essential for the development of the fungus, as was potassium, which was shown very distinctly when the fungus was burned on a platinum wire, showing the violet potassium flame. The magnesium also showed a slight effect when its quantity was reduced. With the zinc no action was observed. It was found that without the presence of a minute quantity of iron the production of spores was not as plentiful.

On increasing the stated amount of any of these ingredients to a large degree the growth was hindered by the too rapid formation of acid or by-products, the effect of zinc sulphate in large amounts acting as a positive antiseptic, while the sugar, if over 15 per cent., prevents rapid growth.

The nutrient liquid cultures used for determining the acid production are stated in a former and following section.

ACID PRODUCTION BY SPECIMEN NO. 28.

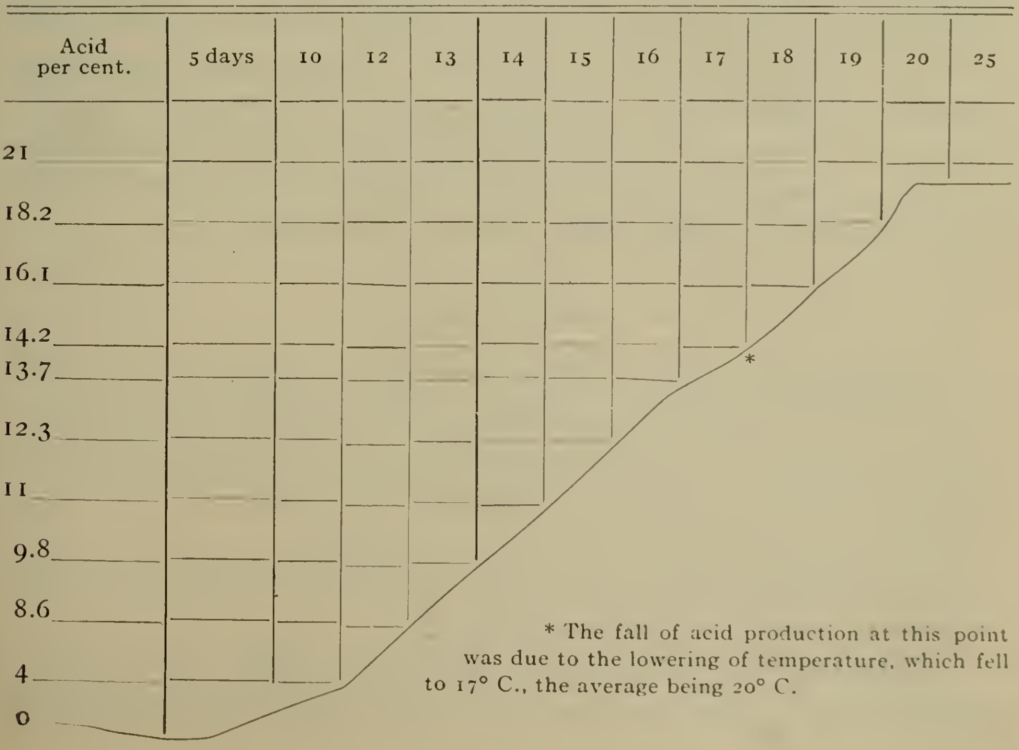
The work leading up to the present division has been to isolate the most active species of fungi in the production of citric acid and to determine the most advantageous conditions for the propagation of this plant. This having been determined, there will now be given the consideration of the plant's activity in its maximum production of acid under these conditions. As specimen No. 28, obtained from the United States Department of Agriculture, Bureau of Plant Industry, was found to be the one answering to these requirements, as was stated in a former section, this plant was used in the following work. Three flasks, each containing 100 Cc. of the 10 per cent. dextrose solution, were inoculated with the spores from the growth of specimen No. 28 on Rawlin's solid media, the fourth being reserved for control. The solutions were agitated gently to evenly distribute the spores and allowed to stand in the light at an average temperature of 20° C. It being a warm time of the year, this temperature was quite easily maintained. The first appearance of growth was on the fourth day. On the sixth day the solution was gently agitated to intimately mix the liquids, whose specific gravity might have been changed by action of the plant's growth, however, not shaken enough to disintegrate the layer of fungus growth on the surface. About 10 Cc. of the solution was taken from each culture by tilting the flask and allowing the liquid to flow out the side tube, thereby avoiding contamination from opening the mouth of the flask.

Exactly 10 Cc. of each of these solutions were titrated with NaOHV.S.n/10 after first being treated as given under section of "Chemistry." No acid was produced at this time, the amount of V. S. required for neutralization being equal to that of the blank test. On the twelfth, twenty-fourth, and thirtieth days the same procedure was carried out with the decided results as given in Table III. It was found, as shown on the chart, that after the twenty-fourth day there was little production of acid.

To carry out a more detailed examination of this acid production a fermentation jar was constructed along lines proposed by Professor Kraemer, in which a large quantity (5000 Cc.) of the nutrient solution could be acted upon. This jar consists of a three-gallon glass jar, covered at the top with wire netting, over which was placed non-absorbent cotton. To the wire netting was suspended a thermometer, a glass inlet tube, and a wire holding an evaporating dish 50 mm. above the surface of the liquid and containing KOH, its object being to absorb CO_2 given off from the plant's growth and to keep a circulation of air throughout the jar, which was found for this purpose quite satisfactory. At the base of the jar was an outlet spigot for the withdrawal of the solution. The jar was sterilized by rinsing thoroughly with formaldehyde solution, then sealing with the cotton and allowing to stand ten days, the evaporation being complete in that time. The nutrient sugar solution was then run in and inoculated with a culture of No. 28. The growth was equally rapid as that in the small flask, but it was found in a somewhat illustrative way that the acid produced by the plant's growth remained only in a distinct brown layer of about 30 mm. depth at the surface of the liquid. This was proved to be the case by inserting a sterile pipette into the layer and withdrawing 10 Cc. for titration. This made the withdrawal of the liquid from the spigot at the bottom useless and resulted in the use of an enamel-ware pan, which gives the maximum amount of surface for the liquid used. One thousand cubic centimetres of a culture of the same formula were prepared and allowed to ferment in the shallow pan. Ten cubic centimetres of the solution were withdrawn from the centre of the acid layer with a sterile pipette at regular intervals. The results are given on the following chart. So far the determination of the amount of acid produced has

TABLE IV.

Showing the Rapidity in the Production of Acid.



* The fall of acid production at this point was due to the lowering of temperature, which fell to 17° C., the average being 20° C.

been only up to where the acid reaches a concentration of about 20 per cent., and at this point stopping any further production of acid.

To allow the fermentation to proceed there was added calcium carbonate, as was suggested by Wehmer and as is done in lactic acid fermentation. This neutralizes the excess of acid-forming, insoluble calcium citrate and liberates CO_2. One thousand cubic centimetres of solution No. 1, with 5 per cent. of calcium carbonate, were placed in the culture pan and sterilized by boiling; also three cultures of 100 Cc. each, with the same percentage of calcium carbonate. It was found that during the sterilization the nutrient salts were precipitated as insoluble carbonates, leaving the solution alkaline and impossible for the plant's growth. The preparation of the culture was repeated, omitting the calcium carbonate, which was added gradually as the fermentation proceeded, only enough at a time to partly neutralize the excess of acid, having previously sterilized the calcium carbonate to prevent contamination. In this way the fermentation could proceed as long as the dextrose and nutrient solution remained, but as an excess of 10 per cent. of the dextrose was found to be deleterious to the plant's growth, this percentage was maintained. By this method after sixty days the solution was analyzed as given in the section on "Chemistry" and found to contain 43 per cent. of crystallized citric acid. If the fermentation had been allowed to proceed still further there would, no doubt, have been a greater yield of acid, as theoretically eleven grammes of dextrose are equal to six grammes of citric acid. On evaporating this fermented solution, after first removing the nutrient salts as later described, the liquid reached a syrupy consistence, which was allowed to stand and on becoming cool deposited small crystals of citric acid.

CHEMISTRY.

This division of the work will consist of first giving the calculations in determining the acid content of the fermented solutions as stated in Tables II, III, and IV, and then the different chemical tests and color reactions employed in detecting the presence of citric acid and other organic acids.

In examining specimen No. 28 the following method was used to obtain the results as shown in Table IV:

Taking exactly 10 Cc. of the fermented solution and 10 Cc. of unfermented solution as a blank test, there was added a solution of lead acetate until neutral and no further precipitation. This threw down the insoluble lead citrate with lead phosphate and sulphate, the latter two being present as nutrient salts in the solution. This was filtered and washed thoroughly with dilute alcohol. The precipitate was suspended in water and H_2S gas passed through until all the lead citrate was changed to insoluble sulphide, liberating the citric acid. There were also phosphoric and sulphuric acids formed from their salts, but these were taken into consideration with the blank test in the unfermented solution.

The sulphide is separated by filtration and the filtrate boiled until no odor of H_2S is evolved. This solution is then titrated with NaOHV.S.n/10 Ph. indicator and calculated for percentage of citric acid, less the amount required for the blank solution as in former calculations.

In determining the percentage of citric acid as calcium citrate when calcium carbonate is used to neutralize the fermenting solution the liquid is first boiled with the calcium carbonate to throw down all the citric acid in solution, which also precipitates the nutrient salts. This is filtered while hot and washed with dilute alcohol. To the washed precipitate is added dilute sulphuric acid until exactly neutral; this is boiled and the calcium sulphate separated by filtration, leaving citric acid and phosphoric acid in solution, which is titrated with V.S.NaOHn/10, the phosphoric acid being taken care of by a blank test of the nutrient solution.

In determining the presence of acids in the fermented solutions qualitatively the following tests were used:

The formation of calcium citrate by taking about 10 Cc. of fermented solution, add NH_4OH to neutralization and boil off excess of NH_3, allow to cool, and add solution of $CaCl_2$ to excess, which precipitates out the nutrient salts; filter and boil filtrate to near dryness, add solution of NH_4Cl, and repeat evaporation three times, and if the precipitate formed remains insoluble on diluting with NH_4Cl solution it indicates insoluble calcium citrate.

This precipitate of calcium citrate is verified by applying a color test as given by Haeusler (*Chem. Zeitung*), which is as follows: When to citric acid an aqueous-alcoholic solution of vanillin is added and the mixture is evaporated to dryness, the residue, when heated on a water-bath for 10 to 15 minutes with a few drops of 25 per cent. sulphuric acid, will be colored violet. On addition of water a green-colored solution is obtained which, by ammonia water, is turned deep red. On acidulating the liquid is colored green, but the red color is restored when the liquid is made alkaline again with NH_4OH.

Haeusler found that tartaric, malic, oxalic, malonic acids, etc., do not give this reaction. A small quantity of the calcium citrate precipitate was taken and mixed with ten drops of the vanillin solution; this was allowed to stand a few minutes and three drops of 25 per cent. sulphuric acid were added, which liberated the free acid. Heat was gently applied, and when near dryness a very distinct and characteristic violet color appeared. On adding water an immediate green was produced, which changed to a deep red with ammonia water.

Blank color test—10 drops of 50 per cent. alcoholic solution of vanillin was heated with 13 drops of 25 per cent. sulphuric acid. On nearing dryness a yellow, then a brown, and then a violet color was produced. After cooling and adding water the brown color returned, intensified with ammonia.

Denige's reaction for the detection of citric acid in the presence of tartaric, oxalic, malic, sulphuric, and phosphoric acids is as follows:

Small quantities of citric acid are detected by heating the solution to boiling with one-twentieth of its volume of Denige's reagent (5 grammes mercuric oxide, 80 Cc. of water, 20 Cc. concentrated sulphuric acid), 3 to 10 drops of an approximately decinormal potassium permanganate solution being added, a white crystalline precipitate is formed at once.

The oxalic acid was determined by the formation of insoluble ammonium oxalate in a solution of acetic acid, this being obtained by first treating with calcium chloride, dissolving in boiling dilute sulphuric acid, and subsequent treatment with ammonia water and acetic acid.

CONCLUSIONS.

In summarizing this work, avoiding any detail which may have been confusing, the following conclusions have been reached.

Certain fungi, when allowed to grow on a solution of sugar, under proper conditions, will produce citric acid identical in properties to that which occurs in Nature.

The fungi for this action are of the Ascomycetes group and appear as specimen No. 28, which is probably a species of Citromyces as described by Wehmer and grows rapidly in a thin, velvety, green layer over the surface of the liquid.

Different species of this group of fungi have different powers of activity.

The conditions for this fermentation are:

A neutral or slightly acid solution containing proper nutrient salts and dextrose, not exceeding 10 per cent. (However, not dependent on this form of sugar alone.) The temperature should be carefully regulated.

The rapidity in the yield of acid is in proportion to its growth, which is dependent on the temperature, but appears to be independent of light.

It is necessary to have an excess of air for the conversion of the sugar into acid, as is seen by $C_6H_{12}O_6 + 3O = C_6H_8O_7 + 2H_2O$.

Therefore the flask for fermentation should be spacious and shallow, as the acid forms and remains in a layer at the surface of the liquid surrounding the mycelia of the plant.

The production of acid is a gradual rise until it reaches about 20 per cent. of the sugar used. At this concentration the growth of the plant is stopped.

A greater yield of acid may be had by neutralizing the acid formed with calcium carbonate.

This yield may be brought up to 50 per cent. of the sugar used, as may be shown theoretically by the ratio of $C_6H_{12}O_6 : C_6H_8O_7$.

From these statements it appears that this formation of citric acid by fermentation would be of value as a commercial consideration.

It would no doubt give rise to many difficulties at first and require further study and understanding of the action of the plant in this formation before an attempt could be made to produce the acid uniformly on a commercial scale.

This remains to be accomplished, and if properly considered should result in a satisfactory product.

THE PERCENTAGE OF ALCOHOL IN HOME-MADE ROOT BEER.[1]

By Charles H. LaWall.

It is a fact well known to chemists and biologists, as well as to many others, who by experience or training have been brought into contact with certain industries or have studied the subject theoretically, that when yeast is added to any sugar-containing material and subjected to favorable conditions of temperature and moisture it immediately begins to grow and develop carbon dioxide and alcohol.

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[1] Read at the annual meeting of the American Pharmaceutical Association, June, 1916.

The carbon dioxide escapes as a gas and produces the phenomenon of effervescence, which gives the name " fermentation " to the operation, from the Latin *fervere,* to boil. The alcohol simultaneously produced sometimes remains in the finished product and sometimes escapes later on, by reason of its great volatility.

Even in bread making, where yeast is used, alcohol is present to an appreciable extent in the earlier stages of manufacture, and from 0.2 to 0.4 per cent. has been detected in a freshly baked loaf of bread, although the alcohol begins to escape as soon as the loaf is cut, and it is doubtful whether even the most minute traces could be detected in the ordinary bread of commerce.

The unfermented grape juice of the market always contains small amounts of alcohol, ranging from 0.05 per cent. up to 0.5 per cent., the higher amount being found in the carelessly prepared article.

It is very difficult indeed to get away from alcohol entirely. A rotting apple or other juicy fruit is likely to contain minute amounts; vinegar sometimes contains several per cent.; preserves or canned fruits which have started to " work " and have been resterilized contain it, and there are numerous other products which unavoidably and necessarily contain it.

In making some home-brewed root beer recently I suspected, from the physiological effect upon a person who drank a glass of it and who is very susceptible to alcohol, that more alcohol was present than is commonly supposed. The conditions under which the beverage is made are very favorable for the development of appreciable amounts of alcohol. Yeast, sugar, water, and a flavoring extract which usually contains some inorganic salts for the stimulation and nutrition of the yeast, are combined under conditions favorable to the rapid growth of the yeast, and the mixture is then bottled and the bottles are directed to be tightly closed.

When the pressure of carbon dioxide, evolved by the fermenting mixture, reaches a certain point, the fermentation automatically ceases. It may easily be seen that if the mixture is allowed to stand for a short time before bottling, or if the bottles are not entirely filled so that a comparatively large air space remains, fermentation may proceed for some time, and the alcohol content is correspondingly varied or increased.

I accordingly made some experiments to ascertain just how high the alcohol would go under the most favorable conditions, and also to see what the average alcohol content of a product made strictly according to directions would be. The following results were obtained:

After standing 2 days.....0.25 per cent. alcohol.
After standing 3 days.....0.32 per cent. alcohol.
After standing 4 days.....0.35 per cent. alcohol.
After standing 5 days.....0.53 per cent. alcohol.
After standing 6 days.....0.64 per cent. alcohol.
After standing 7 days.....0.81 per cent. alcohol.
After standing 9 days.....1.29 per cent. alcohol.
After standing 10 days.....1.36 per cent. alcohol.
After standing 11 days.....1.52 per cent. alcohol.

No higher alcohol content was observed in this series even after standing for ten days longer.

Later some additional experiments were made, allowing the fermenting liquid to stand for three hours before bottling and also only partially filling the bottles, and while, of course, the alcohol content rose more rapidly in each case, the highest amount noted under the most favorable circumstances was 1.77 per cent.

There is a very delicate question involved as to whether a beverage made in this manner could be sold as a non-alcoholic drink, using the expression "non-alcoholic" in its popular significance as equivalent to non-intoxicating. Under the internal revenue rulings we find No. 804, June 29, 1904, J. W. Yerkes, Commissioner, the following:

"The question whether fermented malt liquor is intoxicating or non-intoxicating is immaterial under the internal revenue laws, although it may be a material question under the prohibitory laws of a State or under local ordinances."

No ruling, so far as I can find, has ever been made with reference to root beer, nor can I find any literature on its alcohol content when made as above described. The soda-fountain root beer, of course, is made by diluting a flavored syrup with carbonated water and therefore contains no more alcohol than the minute amount contributed by the extract used to flavor the syrup, which would not exceed 0.05 per cent., and is not to be confused with the home-brewed or fermented product, which is the subject of this article.

It is recorded in literature that koumiss, which is made from milk fermented under somewhat similar conditions, sometimes contains over 2 per cent. of alcohol.

The foregoing facts may come as a surprise to many who have looked upon home-brewed root beer as a strictly temperance drink. With beer averaging 4 per cent. alcohol, the mathematical ratio becomes apparent that three bottles of home-brewed root beer, which have been allowed to stand for ten days or over, are equivalent to one bottle of ordinary beer.

SOME OF THE CHANGES MADE IN THE NINTH DECENNIAL REVISION OF THE UNITED STATES PHARMACOPŒIA.[1]

By George M. Beringer, A.M., Ph.M.

On the eve of the appearance of the Ninth Decennial Revision of the United States Pharmacopœia, it is very appropriate that the changes made in this legal authority for drugs should be discussed by pharmacists.

The present revisions of the Pharmacopœia and of the National Formulary are the first editions of these books to appear since they were specifically named in the Food and Drugs Act as the standards for the identity and quality of drugs. To revise the Pharmacopœia so that its standards shall properly fulfil this added responsibility has been the paramount thought of the revisers. Hence it may be observed that the Ninth Revision will be noteworthy for this purpose and its consequent aim at scientific accuracy, and this purpose has been the primary cause for many of the changes that will appear in this revision.

From a therapeutic standpoint, the changes made in the strength of the galenical preparations are, as a rule, negligible. For the most part, they have been minor and not sufficient to affect either the action or dosage of the preparations. As most of the potent remedies were brought into harmony with the Brussels International Protocol by the Eighth Decennial Revision, radical changes, such as were then made in the strengths of tincture of aconite and tincture of veratrum, are not now necessary.

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[1] Read at the meeting of the New Jersey Pharmaceutical Association, Long Branch, N. J., June 22, 1916.

It was to be expected that the advances and the changes occurring in medical practice, and likewise the progress of our knowledge of the composition of drugs and their therapeutic actions, would demonstrate that the requirements of that protocol must be revised. Absolute compliance with all of its provisions is already no longer possible. In the two revisions of the Pharmacopœia that have been made since the promulgation of the international protocol, we have given ample evidence of our good faith and adherence to the principles to which our nation as a participant in the Brussels Conference and as a signator to the protocol committed us.

A few of the variations between the requirements of the protocol and those of the United States Pharmacopœia are cited as examples, and the reasons for the non-acceptance of the international requirements are given. The protocol requires that aconite shall be "the tubers of the current year." In America this has never been considered practicable, as *Aconitum Napellus* is not indigenous nor cultivated in this country, and, under the conditions existing during the past two years, it would have been absolutely impossible to have complied with this requirement. Moreover, it is an established fact that aconite, properly stored, retains its activity for a long period, and hence this requirement was considered as unnecessary and has not been adopted in our Pharmacopœia. The protocol specifies that belladonna is to be "only the dried leaf." The commercial article is the dried leaves and tops, and hence the U. S. P. very correctly so defines it. The protocol contains no standards for the tincture or extract of belladonna, except that the latter shall contain "about 10 per cent. of moisture." The U. S. P. provides alkaloidal standards for both. The same criticism applies to the absence of standards in the protocol for the preparations of colchicum and hyoscyamus. The protocol directs that tincture of strophanthus shall be made from the seed and not de-fatted and with a menstruum of 70 per cent. alcohol. We know that the fat in strophanthus is exceedingly disagreeable and nauseating, and that this fat can be removed with purified petroleum benzin without the loss of strophanthin. Moreover, 70 per cent. alcohol will not extract the drug, and hence the U. S. P. improves on the international preparation by the preliminary de-fatting of the seed and the use of alcohol as the menstruum.

The use for which a preparation is commonly administered may, likewise, necessitate a deviation from the protocol, as adherence to its provisions would possibly prove a menace to life. As examples: Bitter almond water is commonly administered in the United States as a vehicle or flavoring medium in fairly large doses, and hence it is directed by the U. S. P. to contain not more than a mere trace of HCN. The protocol requirement is 0.1 per cent. of HCN, and to follow this in the dosage in which bitter almond water is, at times, directed as a vehicle in the United States would be dangerous. The U. S. P. syrup of ipecac is seven times stronger than that of the protocol. As this preparation is commonly used in the United States as an emetic, it was not deemed advisable to so reduce the strength as to render it valueless as an emetic in croup and similar affections in which it is so commonly employed.

As examples of the more important changes of strength of galenicals may be mentioned unguentum hydrargyri dilutum from 33 per cent. to 30 per cent. of mercury in order to comply with the protocol, and syrupus acidi hydriodici, changed from 1.19 Gm. HI in 100 Cc. to from 1.3 Gm. to 1.45 Gm. in 100 mils.

The changes that have been made in the strength of the chemical products are, for the most part, such as were required by the commercial conditions and the quality of the products commonly dispensed as medicines. The principle of allowing for the proper variability of chemicals and for the natural variation in crude drugs has led to many modifications of the rubric requirements by which, instead of the fixed purity statements of the previous revision, there now appears in most of the monographs a variability allowance in accordance with determined conditions, and the limitations of such variability are officially defined. The following examples among the chemicals illustrate the desirability and practicability of this change, which, in many cases, has been only a rounding off of the requirements: The Eighth Revision required that diluted hydriodic acid should contain not less than 10 per cent. HI; the Ninth Revision will state from 9.5 to 10.5 per cent. HI. In the Eighth Revision, hydrochloric acid was required to contain not less than 31.9 per cent. HCl; the Ninth Revision will state from 32 to 33 per cent. HCl. In the Eighth Revision, ether was about 96 per cent. ethyl oxide; in the Ninth Revision it will be from 95.5 to 97.7 per cent.

The purity of a few official chemicals has been increased. As examples, the bromides of ammonium, potassium, and sodium have been each increased from 97 per cent. in the Eighth Revision to 98.5 per cent. of the respective absolute bromide. In a few cases the rubric is not so exacting as in the previous revision. The reasons for such modification are usually self-evident. As examples, ferric chloride is to contain 20 per cent. of Fe instead of 22 per cent., and thymol iodide 43 per cent. of iodine instead of 45 per cent.

A noticeable improvement is seen in the pharmacognostic descriptions. Here we have not only the microscopic appearance and structure of the drug described, but also descriptions of the powdered drug under the microscope. The purity rubric has been extended to the organic drugs, and these monographs commonly give the percentage of allowable admixtures of other parts of the drug plants or other foreign matters. In the organic drugs and their preparations that permit of chemical assaying, limitations are likewise fixed for the variability naturally existing in the drugs and the personal equation or error introduced in the assay processes, and in each case the alkaloidal percentage is fixed by an upper and lower limit.

The assay processes introduce several changes, such as the use of purified saw dust as a distributing medium, and the adoption of the aliquot part method. Cantharides has a definite standard of cantharidin of not less than 0.6 per cent., and an assay process is now given. In nux vomica, the percentage of total alkaloids is fixed at 2.5 per cent. in place of 1.25 per cent. strychnine, and the preparations of nux vomica are all assayed for total alkaloidal content. Opium must now contain not less than 9.5 per cent. *anhydrous* morphine instead of not less than 9 per cent. *crystallized* morphine, and the lime method of assay is adopted. This increase in strength is to be noted, and likewise the determination of morphine content in the anhydrous form instead of that of the crystallized alkaloid.

Assay processes have been extended to numerous preparations not previously assayed. Among such may be mentioned benzoic and salicylic acids, and citrated caffeine; and among preparations, liniment of camphor and spirit of camphor, for which a polariscope method for the determination of camphor is now introduced. Very few pharmaceutical laboratories have the expensive polariscopes required. Hence I fear that this test is more academic than practicable, and its observance in practice will be largely confined to the State Laboratories.

The Ninth Revision will be noted for the number of innovations in pharmacopœial revision. Among these may be mentioned "Electrolytic Determination," which is especially recommended as the method for assaying zinc and mercury compounds; official methods for the "Determination of Ash," "Saponification Values," "Acid Number of Resins," "Determination of Crude Fibre," "Volatile Extractive and Non-volatile Extractive," "Determination of Alcoholic Content," "Melting Points," "Boiling Points," and "Congealing Points," with a description of "Standard Thermometers, and Solubilities." The chapter on "Sterilization" should be carefully studied by every dispenser. The chapter on "Diagnostical Reagents and Clinical Tests" is an important addition to the U. S. P., in which the example of the later revisions of some of the foreign pharmacopœias, notably the German Pharmacopœia, is followed. This contains standard formulas for the reagents used in the examination of urine, gastric contents, blood, and microörganisms.

For the first time in the history of pharmacopœial revision, the methods for the biological assaying of drug products have been recognized. Chapter 23, in Part 2, is devoted to this subject, and official processes are described by which the following drugs and their preparations *may be* assayed: aconite, digitalis, strophanthus, squills, and dried suprarenals, and cannabis *must be* assayed by the official biological process. The standard adopted for the latter drug is that "Cannabis made into a fluidextract in which one hundred mils represent one hundred grammes of the drug when assayed biologically, produces incoördination when administered to dogs in a dose of not more than 0.03 mil of fluidextract per kilogramme of weight."

The titles added to the list of pharmacopœial substances are only 66 in number. Some of these have been added because of their use as medicines necessitating standards. Among such may be mentioned ethyl morphine hydrochloride, diacetyl morphine and diacetyl morphine hydrochloride, sodium cacodylate, glycerophosphates of calcium and sodium, creosote carbonate, and phenolphthalein.

Commercial conditions necessitated several changes. As examples: virgin scammony not being now obtainable, scammony root was introduced as the source for making the official scammony resin, and sodium cyanide replaces potassium cyanide. The high price of potash salts, due to the war, has been recognized, and permission is given to substitute the sodium carbonates in place of the potassium carbonates in solutions of magnesium citrate, rhubarb preparations, etc.

Several of the additions became necessary because they are ingredients in the formulas of the Pharmacopœia. Among these may be mentioned glucose, directed as a diluent for solid extracts; purified kieselguhr as a filtering medium, oil of sesame as an ingredient in liniments, and sodium indigotindisulphonate, introduced as a coloring for corrosive sublimate tablets, which are to be "tablets of an angular shape (not discoid), having the word "POISON" and the skull-and-crossbones design distinctly stamped upon each, and to contain 0.45 Gm. to 0.55 Gm. corrosive sublimate, and the tablets to be colored blue."

The preparations added have not been numerous, the tendency being to leave to the National Formulary the providing of formulas for preparations. Milk of bismuth and milk of magnesia are two of the popular remedies, however, that have been given pharmacopœial standing.

Pharmacists will be pleased to learn that the list of powdered extracts has been greatly extended, and in several instances formulas for both the pilular extract and the powdered extract of the same drug are very properly given. The instructions of the Pharmacopœial Convention to adopt general formulas wherever possible has been partially carried out by the introduction of general instructions in the aromatic waters, and by general formulas and classifications in the fluidextracts and tinctures.

Two hundred and forty-two titles have been dismissed from the Pharmacopœia. Thirty-eight of these were fluidextracts, seven were pills, and ten were tinctures. A majority of these preparations have been included in the Revised National Formulary, and so the National Formulary will relatively become more important because of these deletions from the Pharmacopœia.

Twenty-nine changes in the Latin titles have been made, and 28 changes in the English names. As examples: alcohol absolutum is now alcohol dehydratum; aqua hydrogenii dioxidi is now liquor hydrogenii dioxidi; cardamomum is now cardamomum semen, the decorticated seed being the official drug; elixir adjuvans is now elixir glycyrrhizæ; hyoscinæ hydrobromidum is now scopolaminæ hydrobromidum; rhamnus purshianæ is now cascara sagrada.

One of the minor changes that has attracted, nevertheless, a great deal of attention is the adoption of the word "millilitre" in place of "cubic centimetre," and the word "mil" in place of "Cc."

In this we have followed the example of the British Pharmacopœia and accepted the authority of the United States Bureau of Standards for the sake of absolute accuracy.

Synonymy will not be treated through the Index as in the Eighth Revision, but following each Latin title will be the official English title and the more commonly used synonyms. In addition to this, there will be the official abbreviation printed in heavy type, with the hope that physicians will adopt these official abbreviations in prescription writing, so that there will be an official authority for the abbreviations for the official titles commonly used in prescriptions.

SOME FALLACIES REGARDING PHENOL.[1]

A Review with Reports of Observations on the Influence of Ethyl Alcohol on the Germicidal and on the Toxic Properties of Phenol.

By Martin I. Wilbert, Technical Assistant, Hygienic Laboratory, United States Public Health Service.

There are probably few official drugs regarding which more misleading statements have been made than phenol, or, as it is more widely known, carbolic acid. This substance was first recognized by Runge (1834), who called it carbolic acid to indicate its nature and origin; an oil-like liquid, obtained from coal, that has much in common with well-known acids. Phenol was early confounded with creosote, isolated by Reichenbach (1832) from beechwood tar, and under the name coal-tar creosote an impure commercial phenol was long listed and freely sold to less well-informed dealers, who unknowingly substituted this more poisonous commercial product for beechwood creosote for internal use.

With the advent of crystalline phenol and its subsequent use as an antiseptic in surgical practice, better informed medical practitioners began to appreciate the difference between the two products, but even at the present time it is not uncommon to find commercial grades of phenol referred to as coal-tar creosote.

The widespread use of phenol as an antiseptic and a disinfectant by medical practitioners served to bring it to the attention of the laity as a poison, and as early as 1890 it was asserted that phenol or carbolic acid was employed more frequently by suicides than any other drug.

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[1] Reprint from the *Public Health Reports,* vol. 31, No. 17, April 28, 1916, pp. 1046–1054.

The toxicology of carbolic acid early attracted attention, and a record of the substances that have been recommended as antidotes for phenol poisoning, with a review of the reasons for recommending them, would be an interesting study, in that it would tend to emphasize the futility of basing conclusions on incomplete or at times misleading observations.

The use of fixed oils, of glycerin, and of diluted sulphuric acid, and the use of soluble sulphates of the alkalies and alkali earths, while apparently justified on the basis of the earlier observations, have long since been recognized as being inefficient and in many instances distinctly harmful.

The rather widespread use of ethyl alcohol as an antidote for phenol poisoning and the studious avoidance of ethyl alcohol as a diluent for phenol used as an antiseptic or disinfectant, while long since shown to be based on erroneous reasoning, still persist, and, as will be noted later, the belief in the efficiency of ethyl alcohol as a detoxicant for phenol appears to be growing rather than decreasing.

It was early found that alcohol is a better solvent for phenol than is water, and it was also found that mixtures of phenol with alcohol, fixed oils, glycerin, or camphor were less caustic than phenol alone, and under some conditions appeared to be less toxic than solutions of phenol in water.

Glycerin, it was early observed, will lessen the caustic local action of phenol on the skin, but experience has since shown that it will not prevent the production of gangrene nor the absorption of phenol.

A mixture of phenol and glycerin was recommended by Nathan Rosewater and others [2] as a safe and efficient substitute for phenol. In recommending this mixture, it was pointed out that " not being as caustic as phenol, it cannot result in as much mischief or fatality if taken internally, either accidentally or on purpose."

Harrison Allen, as editor of "A Handbook of Local Therapeutics" (Philadelphia, 1897), makes the assertion that "carbolic acid dissolved in oil or in alcohol is inert. Anthrax spores were found to be unaffected after lying upward of three months in a 5 per cent. solution of carbolic acid in oil and equally so by 70 days' exposure to a 5 per cent. solution in alcohol. Even the sensitive anthrax bacilli were not destroyed by a 5 per cent. solution of carbolic acid in oil."

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[2] American Journal of Pharmacy, 1895, vol. 67, p. 221.

Dr. Seneca D. Powell, of New York, was among the first to systematically recommend the use of alcohol as an antidote for phenol. He based his recommendation on the naïve but evidently fallacious deduction that the action of alcohol in the stomach must be analogous to its action on the unbroken skin.

Phelps[3] appears to have been the first to call attention in print to the antagonism of alcohol to phenol. He quotes Dr. Seneca D. Powell, who in his clinics at the Postgraduate Hospital demonstrated the antidotal value of alcohol by consecutively rinsing his hands in liquid phenol and then in alcohol.

Since that time alcohol has frequently been recommended and largely exploited as an antidote to carbolic acid, despite the fact that it is of little value other than as a diluent. The exploitation of alcohol as an antidote and as a possible prophylactic for phenol poisoning has led to its recognition in state and other laws designed to restrict the sale and use of various poisons.

Williams[4] was among the first to make the suggestion that, "in view of the frequently made assertion that grain alcohol is an efficient antidote for carbolic acid and that this poison may be taken with impunity if immediately followed by alcohol, it would appear that a mixture of phenol and grain alcohol would be a comparatively safe household preparation. The claim of the comparative innocuousness of carbolic acid under the conditions named is apparently well founded."

This fallacious suggestion has been embodied in several state and local laws and regulations designed to restrict the sale of carbolic acid. These laws usually provide that the requirements embodied therein do not apply to the sale of crude carbolic acid or to the sale of a solution or mixture containing equal proportions of carbolic acid, glycerin, and alcohol. That this misleading statement, originally made more than twenty years ago, is still a factor in the enactment of restrictive legislation is apparent from a paragraph embodied in the recently (1915) enacted laws of California and of Utah. These laws provide that the restrictions relating to the sale of carbolic acid do not apply to solutions of carbolic acid ("phenol") containing not over 10 per cent. of carbolic acid ("phenol") and not less than 10 per cent. of ethyl alcohol.

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[3] *New York Med. Jour.*, 1899, vol. 69, p. 62.

[4] *Drug. Circular,* March, 1900, p. 46

The same line of reasoning which led to the belief that ethyl alcohol is an efficient prophylactic and antidote for phenol because of its power of removing phenol from the skin also led to a rather widespread belief that mixtures of phenol with alcohol or solutions of phenol and alcohol in water are less efficient as antiseptics or disinfectants.

Taylor,[5] in a report of an experimental study with alcohol-resistant yeasts to determine the antagonism of alcohol to phenol, concludes that this supposition appears to have some physical basis, but is not due to any chemical detoxication of phenol by ethyl alcohol. From his experiments he concludes that alcohol does not reduce in the least the antiseptic action of carbolic acid, the toxicity of the phenol not being at all involved. With a high concentration of alcohol and a low concentration of phenol the alcohol seemed to increase to some extent the antiseptic value of the phenol.

Taylor concludes "that there is no chemical detoxication of phenol by ethyl alcohol and that the effects observed in therapeutic practice must rest upon some physical basis." He also points out that recent investigations by Sollmann support this conclusion.

Zemp[6] appears to have been among the first to question seriously the value of ethyl alcohol as an antidote to phenol. He says: "That alcohol is a splendid solvent for many drugs is recognized by all. It is because of this power that it has been recommended as an antidote to carbolic acid. No chemical action takes place when these two drugs are brought together. The carbolic acid is simply diluted, hence its caustic power is diminished."

Macht[7] reports an experimental study of lavage in acute carbolic acid poisoning in which he clearly demonstrates that, contrary to popular experience and belief, the internal use of alcohol in cases of phenol poisoning may be unfavorable. The conflicting opinions in regard to the use of alcohol are somewhat reconciled by his investigations. He finds that the influence of alcohol depends on the time of administration. If it is given after the ingestion of phenol, as must be the case therapeutically, the symptoms will be aggravated, the alcohol acting as an excellent solvent for phenol, promoting rather than retarding its absorption, so that death may actually be hastened. On the other hand, he found that an animal previously intoxicated with alcohol can withstand better the effects of phenol taken afterwards.

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[5] *Jour. Biol. Chem.*, 1908–9, vol. 5, p. 319.

[6] *New York Med. Jour.*, 1909, vol. 89, p. 476.

[7] *Johns Hopkins Hosp. Bull.*, 1915, vol. 26, pp. 98–104.

To determine the relative influence of ethyl alcohol and of glycerin on the actions of phenol it was thought desirable to repeat in a modified way some of the experiments previously reported. The results of these experiments are appended and clearly show that ethyl alcohol in the presence of water has no appreciable influence on the toxicity or on the germicidal properties of phenol, and that it may therefore be advantageously used as a solvent alone, or in mixtures to promote the solubility of phenol in water for use as a germicide or disinfectant.

The experiments to determine the germicidal value of mixtures of phenol and alcohol and of phenol and glycerin were made in the Hygienic Laboratory by Mr. Albert F. Stevenson and Miss Rose Parrott.

The technic followed was that described in *Hygienic Laboratory Bulletin* No. 82, " The Determination of Phenol Coefficient of Some Commercial Disinfectants," by Thomas B. McClintic.

The results, as evidenced in the appended tables, clearly show that in the presence of water both alcohol and glycerin are practically inert so far as any detoxicating action may be concerned.

In the presence of a larger percentage of alcohol there appears to be some increased activity, due probably to a slight increase in the solvent and penetrative properties of the mixture.

An abstract of a report on the effect of alcohol on the toxicity of phenol, made by Dr. Liston Paine, Assistant Surgeon, United States Public Health Service, is also appended. The results noted serve to emphasize the findings previously reported and suggest the fallacy of enacting legislation designed to promote the sale of mixtures of phenol and alcohol under the impression that ethyl alcohol will serve as a detoxicant to phenol.

In conclusion, it may be again noted that the experimental work clearly shows that the addition of ethyl alcohol to phenol not only increases the solubility of phenol in water, but also increases rather than diminishes the antiseptic value of the resulting solution. Ethyl alcohol can be used to advantage as a substitute for glycerin in making antiseptic solutions of phenol.

The experiments with animals clearly show that the addition of ethyl alcohol to solutions of phenol in water does not, in any way, inhibit the toxic action of phenol, but rather tends to facilitate absorption and thus hasten death.

THE EFFECT OF ALCOHOL OR GLYCERIN ON THE TOXICITY OF PHENOL AS SHOWN BY INOCULATIONS INTO WHITE MICE.

(An abstract of a report by Dr. Liston Paine, assistant surgeon, United States Public Health Service.)

For the experiments recorded in the appended tables the technic was practically as outlined in *Hygienic Laboratory Bulletin* No. 88, "Method for Determining the Toxicity of Coal-tar Disinfectants," by Worth Hale.

The mice used were prepared in the afternoon of the day before they were to be injected, so as to insure a maximum of time for observing the development of symptoms.

The symptoms manifested by the mice referred to in the accompanying tables were typical of phenol poisoning. The mice that were injected with a mixture of phenol and alcohol or phenol and glycerin showed the symptoms just as early and to as marked an extent as the mice receiving phenol alone.

To determine the effect of ethyl alcohol, a solution containing twice as much alcohol as the maximum amount used with phenol was injected. All of these mice recovered within 24 hours, though all were stupefied from the effect of the alcohol and three appeared to be moribund.

On injecting the same mice on the following day with an aqueous solution to determine whether such previously alcoholized mice could better resist the toxic action of phenol it was found that three died from approximately the same dose that proved fatal for other animals. (See Table E.) It should be noted in this connection that in this series of mice the phenol was injected after the mice had apparently recovered from the effects of the alcohol. It is probable that most of the alcohol had been excreted through one or another channel within the intervening 24-hour period.

In the appended tables an effort has been made to include only the essential information recorded in the protocols. The dose per mouse and dose per gramme of mouse represent the weight of phenol in the solutions used.

TABLE 1.

Standard Phenol in Water.

RESULTS OF A TEST (WITHOUT ORGANIC MATTER).

(+ means growth; — means no growth.)

Sample	Dilution	Time culture exposed to action of disinfectant in minutes					
		2½	5	7½	10	12½	15
Phenol....................	1:80	—	—	—	—	—	—
	1:90	—	—	—	—	—	—
	1:100	+	—	—	—	—	—
	1:110	+	+	—	—	—	—
	1:120	+	+	+	+	+	—

TABLE 2.

A Mixture of Phenol 1 and Glycerin 1 in Water.

RESULTS OF A TEST (WITHOUT ORGANIC MATTER).

(+ means growth; — means no growth.)

Sample	Dilution	Time culture exposed to action of disinfectant in minutes					
		2½	5	7½	10	12½	15
Phenol....................	1:80	—	—	—	—	—	—
	1:90	—	—	—	—	—	—
	1:100	+	—	—	—	—	—
	1:110	+	+	—	—	—	—
	1:120	+	+	+	+	+	—

TABLE 3.

A Mixture of Phenol 1 and Alcohol 1 in Water.

RESULTS OF A TEST (WITHOUT ORGANIC MATTER).

(+ means growth; — means no growth.)

Sample	Dilution	Time culture exposed to action of disinfectant in minutes					
		2½	5	7½	10	12½	15
Phenol....................	1:80	—	—	—	—	—	—
	1:90	—	—	—	—	—	—
	1:100	+	—	—	—	—	—
	1:110	+	+	—	—	—	—
	1:120	+	+	+	+	+	+

TABLE 4.

A Mixture of Phenol 1 and Alcohol 3 in Water.

RESULTS OF A TEST (WITHOUT ORGANIC MATTER).

(+ means growth; – means no growth.)

Sample	Dilution	Time culture exposed to action of disinfectant in minutes					
		2½	5	7½	10	12½	15
Phenol	1:80	–	–	–	–	–	–
	1:90	–	–	–	–	–	–
	1:100	+	–	–	–	–	–
	1:110	+	–	–	–	–	–
	1:120	+	+	+	–	–	–

(*To be continued*)

BOOK REVIEWS.

THE PHARMACOPŒIA OF THE UNITED STATES OF AMERICA. NINTH DECENNIAL REVISION. By authority of the United States Pharmacopœial Convention held at Washington, D. C., May 10, 1910. Prepared by the Committee of Revision and published by the Board of Trustees. Official from September 1, 1916. Philadelphia Agents: P. Blakiston's Son & Company. Sub-agents: New York, Paul B. Hoeber, 67 East Fifty-ninth Street; Chicago, Chicago Medical Book Company, Congress and Honore Streets; St. Louis, Lewis S. Matthews & Co., 3563 Olive Street; San Francisco, H. S. Crocker Company, 565 Market Street.

The Ninth Revision of the United States Pharmacopœia is out at last. While the delay in getting out this revision may have been disconcerting to those desiring the new revision, yet this is more than compensated by the excellence of the new work. Probably in connection with no revision have so many new features been introduced as in the Ninth Revision, and this required the revisers to carefully consider all the questions involved and to render a final decision only after mature judgment could be formed. It is not our object in this review to go over in detail this new book, as we publish elsewhere in this issue an excellent summary of the main features of this revision. A few facts from the Preface and Introductory Notices may be sufficient to indicate some of the changes that have been adopted. The scope of the Ninth Revision is indicated by the following: "The consensus of opinion of the committee was, in effect, to provide standards for vegetable drugs, chemical substances, and such pharmaceutical preparations as were simple in their character, and most largely used. A few compound preparations, however, were retained because of their large use; an increase has been made in the number of standardized serums and animal products. A number of synthetic remedies have been added to the list which the Subcommittee on Scope had recommended for admission, permission having been granted by the manufacturer, firm, or corporation to include such substances; unfortunately the European war has interfered with the receipt of some answers from foreign countries. In most cases where answers were received the replies were in the negative."

It is stated that "The class of preparations known as 'Wines' has not been included in this revision. Wine as a menstruum or solvent can with advantage be replaced by alcohol of various strengths, and the uncertainties, due to the variability in quality and alcoholic content of the wines of commerce, are avoided."

In regard to number of admissions and deletions, "The number of articles, reagents, and assays in the present Pharmacopœia is 1436; there were 1297 in the previous Pharmacopœia. In the present book there are 782 articles in the text; 277 test solutions and volumetric solutions, 315 volumetric, gravimetric, and other assays, and 62 diagnostical reagents. In the U. S. P. VIII there were 958 articles in the text, 155 test solutions and volumetric solutions, 149 volumetric assays, and 35 gravimetric assays. Of those articles official in the text of the U. S. P. VIII, 243 have been dismissed, while 67 new ones have been introduced into the U. S. P. IX."

One of the most interesting changes is the replacement of Cc. by Mils. "The United States Bureau of Standards declared that the term cubic centimetre was a misnomer, there being a slight difference between the thousandth part of a litre and the cubic centimetre, as one litre was determined to be equivalent to 1.000027 cubic decimetres. The Committee of Revision decided that the time had come to adopt the word mil, the first three letters of the whole word millilitre. In addition, the change promotes international uniformity in the two Pharmacopœias published in the English language."

The language of the chemical tests has been changed, the imperative mood being used in place of the conditional form of previous Pharmacopœias. In former revisions nearly every test began, "If — Gm. be dissolved." In the present revision it is changed to the imperative "Dissolve — Gm., etc." The Appendix is now designated as Part II, Table of Contents precedes it, and a more systematic arrangement has been adopted. "Much revision was found necessary in this part of the work, and the list of reagents has been enlarged. While a knowledge of the chemical analysis is presupposed, the committee has deemed it not out of place to add explanatory remarks or instruction in the details of manipulations in Part II." Furthermore, "In the chemical tests an extension has been made of the plan employed in the previous Pharmacopœia where general tests were adopted for arsenic and heavy metals. The additions will be found in Part II. The adoption of this plan saves space by avoiding frequent repetition of detail in the text of Part I."

Probably the greatest departure in the IX U. S. Pharmacopœia is in the text for vegetable drugs. For the first time the histological treatment has been introduced throughout the work. The microscopic structure of the crude drug has been introduced wherever necessary, and the microscopical characteristics of powders are in nearly all cases given. It is stated in the Introductory Notice: "In the case of vegetable drugs, the standards provided in the text apply also to the powdered or ground drug. For the preservation of vegetable or animal substances from the ravages of insects, it is directed in special cases that they be preserved in tightly-closed containers and a few drops of chloroform or carbon tetrachloride added. It is not intended that this precaution should be used for drugs imported in bales or large original containers. This precaution is intended to aid in the preservation of drugs in the stock of a pharmacist."

The official date on which the IX U. S. Pharmacopœia goes into effect is September 1, 1916.

SQUIRE'S COMPANION TO THE BRITISH PHARMACOPŒIA (1914). Nineteenth Edition, demi-octavo, pages 1712. J. and A. Churchill, 7 Great Marlborough Street, London, W. Price, 15/-net, post-free (inland) 15/7d.

The new Nineteenth Edition of Squire's Companion to the British Pharmacopœia contains a systematic and critical record of the alterations and additions to the new British Pharmacopœia, showing which preparations are new, which are stronger, or which are weaker, the alterations being plainly indicated in the text by the adoption of distinctive markings; *e.g., New, Altered,* or *Modified,* as the case may be. The British Pharmacopœia is also critically compared with the United States and German Pharmacopœias, this criticism being extended in important instances to a comparison with the French and Swiss Pharmacopœias.

The arrangement of matter, which has been distinctive of Squire's Companion for over fifty years, is continued in the present edition, as this method of arrangement has been found to be the most convenient for ready reference. The Latin and English titles of the substance appear at the head of each monograph, followed by the French, German, and Italian names under which it is known, a short description, together with, in the majority of instances, a brief account of its usual method of preparation, Solubility, Medicinal Properties, Dose, Prescribing Notes, Incompatibles, Official Preparations, Not Official Preparations, Antidotes, Foreign Pharmacopœias and Tests. In the case of the Materia Medica, these paragraphs are supplemented by Descriptive Notes, which have been revised and brought up to date by Mr. E. Morell Holmes.

The paragraphs on Solubility introduce a number of figures specially determined for this edition, while in those cases in which there has been reason to doubt the accuracy of figures appearing in the previous editions these have been either confirmed and the old figures retained, or, where necessary, the figures have been modified to meet the new conditions. The paragraphs on Solubility have formed a distinctive feature of Squire's Companion since 1864, and is one of the most valuable practical features of the book.

The paragraphs on Medicinal Properties have been entirely revised and brought thoroughly up to date, some of the references being as late as April, 1916. They form an exhaustive review of over half a century's progress in therapeutics. In order to make this review as complete and useful as possible, the more important of the older and obsolete matter has been condensed and incorporated in the general text of the book, while the unimportant part has been entirely deleted. The uses of hypochlorous acid as an antiseptic are included under Calx Chlorinata, on page 367. With descriptions of Eupad and Eusol, the new antiseptic Chloramine is referred to in the supplementary matter on page 1541. An account of the Iodine treatment of wounds appears on page 771. The latest compounds used in syphilis are referred to on page 1189 to 1198, and include Kharsivan, Neo-Kharsivan, Galyl, Hectine, and Intramine.

The Prescribing Notes represent the author's personal experience of over forty years in the dispensing of physicians' prescriptions. In many instances the information regarding the dispensing of a particular drug is embodied in the form of a Prescribing Note in preference to introducing it under the heading of Not Official Preparations. Typical instances appear under Acetanilide, page 8; Acidum Boricum, page 33; Acidum Carbolicum, page 40; Ergot, page 568, and Tinctures, page 1400.

Doses are given in the Imperial and Metric systems. In the case of potent remedies the pharmacopœial dose is compared with the maximum single and maximum daily dose of one or more of the important continental pharmacopœias.

A list of Official and Not Official Preparations is given under the heading of each important substance. The paragraphs on Foreign Pharmacopœias compare the substance under review with 17 other foreign pharmacopœias.

A reference to the Preface shows that the paragraphs on Tests have been entirely rewritten; these paragraphs not only furnish a critical comparison of the tests appearing in the British with those appearing in the United States and German Pharmacopœias, but this is supplemented, in important instances, by a comparison of the tests given in the French and Swiss Pharmacopœias. Very many references are made to the work done in the laboratory of the author. They comment on and supplement the Official Tests, and in some instances show that tests which are now Official in the British Pharmacopœia have been described in previous editions of Squire's Companion. A great deal of attention is devoted to the standardized preparations of the British Pharmacopœia, which are very thoroughly compared with those of the other continental pharmacopœias.

In dealing with the special chapter on Chemicals, Reagents, etc., used in qualitative testing, volumetric analysis, indicators, and special tests, the same comparative method has been adopted, the British being compared with the French and German Pharmacopœias. Methods are given for the determination of physical constants and analytical memoranda relating to special tests, and include such constants as melting-points, solidifying points, boiling-points, optical rotation, refractive index, specific gravity, arsenic and lead tests, acid and saponification values, unsaponifiable matter, and the determination of esters and alcohols in volatile oils.

The concluding sections of the book are occupied by a description of Spas, enumerating first those of Britain and subsequently the foreign Spas, a classification of mineral waters and a therapeutical classification of remedies, and a general index. In order to complete the utility of the book as a work of reference, the index has been printed in specially bold type, and a clear differentiation has been made between substances which are Official and those which are Not Official, the former being printed in Roman and the latter in italic type.

PENNSYLVANIA PHARMACEUTICAL ASSOCIATION.

With the largest registration in its history, the thirty-ninth annual meeting of the Pennsylvania Pharmaceutical Association at Reading, Pa., on June 20, 21, and 22, was not only the largest and most successful of any of its predecessors, but demonstrated most conclusively that the centrally located city as a meeting place can be made just as attractive—possibly more so—as the mountain resort. Not since 1899 has the Pennsylvania organization held its sessions at other than a summer resort, and the innovation, it was feared, would not be a success. But the contrary was proved most emphatically.

Discussion and action upon legislative issues dominated the business sessions of the association. An itinerant venders' bill in revised form, it was decided, should be presented by the incoming Legislative Committee at the session, next January, of the Pennsylvania Legislature. The report of Chairman S. C. Henry, of the Legislative Committee, contained a recommendation that the Pennsylvania Drugs Act be changed so as to harmonize entirely with the Ninth Revision of the United States Pharmacopœia and the National Formulary, as well as the Shirley Act. This was approved by the association, as well as the proposed amendments to the Pharmacy Act which will provide for the recognition and registration of those having experience in hospital pharmacies and who are otherwise qualified and can pass the State Board, and will compel hospitals where prescriptions are compounded to have a registered pharmacist in charge. The incoming committee will also endeavor to frame legislation pertaining to the sale and possession of narcotic drugs that will provide for the contingency created by the recent decision of the Federal Courts under which it is no longer considered a misdemeanor for persons other than those properly registered to have the restricted narcotic drugs in their possession.

The Stevens-Ashurst Bill was endorsed; affiliation with the National Association of Retail Druggists continued, and honorary membership, upon the recommendation of retiring President Theodore Campbell, conferred upon W. B. Day, of Chicago, Ill., general secretary of the American Pharmaceutical Association.

The election of officers resulted as follows: President, Adolph Schmidt, McKeesport; first vice-president, M. W. Bamford, Reading; second vice-president, W. H. Knoepfel, Scranton; secretary, R. P. Fischelis, Philadelphia; assistant secretary, L. H. Davis, Philadelphia; local secretary, B. W. Pritchard, Pittsburgh; treasurer, P. H. Gliem, Lebanon; member of the Executive Committee, D. J. Reese, Philadelphia. Mr. Reese had been the efficient secretary of the association since 1914, but press of other business made it impossible for him to accept a renomination this year.

The invitation of the Western Pennsylvania delegation to visit them next year was accepted, and the Hotel Schenley, Pittsburgh, was chosen as the meeting place, June 19, 20, and 21, 1917.

The program of entertainment contributed greatly to the success of the meeting. One day, the visitors were the guests of the Reading Chamber of Commerce and the retail druggists of that city in a trolley tour and luncheon at the Tower, a lofty mountain resort, overlooking the city. Wednesday evening, William H. Luden, the well-known confectionery manufacturer of Reading, was host to the convention at a banquet at the Hotel Berkshire, where the sessions were held, while throughout the meeting there were all sorts of scientific and guessing contests, dances, automobile trips, athletic sports, and card parties, designed either for the entertainment of the ladies or for the men when sessions were not scheduled.

The handsome gold prize for the best paper presented at the 1915 session was awarded to Charles H. LaWall, of Philadelphia, while throughout the meeting the association maintained its enviable reputation for the number and excellence of the papers read.

Reading druggists and their good wives proved ideal hosts, while the excellent roads, numerous trolley and steam lines, made it very accessible for druggists from all over the State. Automobile parties from Philadelphia, 58 miles away, were very numerous. That city, as usual, sent the largest contingent.

The report of Secretary Reese, of the parent organization, showed that of the 162 members elected during the year, 135 applications had been secured directly by the Travelling Men's Auxiliary. The salesmen gave an excellent entertainment after the Luden banquet, and proved, as usual, a powerful working arm of the association.

The Auxiliary elected the following officers: President, John Q. Reinhart; vice-president, W. M. Skivington, Philadelphia; treasurer, J. D. McFerren, Philadelphia; secretary, J. W. Garlick, Philadelphia.

PHILADELPHIA COLLEGE OF PHARMACY.

Minutes of the Quarterly Meeting.

The quarterly meeting of the Philadelphia College of Pharmacy was held June 26, 1916, at 4:15 P.M., in the Library, the President, Howard B. French, presiding. Seventeen members were present.

The minutes of the annual meeting, held March 27, were read and approved. The minutes of the Board of Trustees for March, April, and May were read by the Registrar, J. S. Beetem, and approved.

The report of the Committee on Necrology was read by Prof. Henry Kraemer, Chairman, and is as follows:

> During the past year we have lost through death but one member, viz., Dr. Joseph A. Heintzelman. He conducted one of the oldest drug stores in Philadelphia, and died October 19, 1915. Doctor Heintzelman was born in Germany, in 1834. At the age of twenty-four he came to this country, devoting himself for several years to the study of pharmacy and medicine, graduating from the Philadelphia College of Pharmacy in 1859. In 1874 he opened a drug store at the corner of Ridge and North College Avenues, which was then considered a suburban point of Philadelphia. (For a few years prior to this he was located at Tenth and Ogden Streets.) He not only conducted a drug store in this locality, but was a practising physician and very highly esteemed in this community. He played a very important part in the development of this section of the city, and was quite active in a number of German societies and fraternal orders in Philadelphia. Doctor Heintzelman was ill but a short time, and died at the home of his son, Joseph A. Heintzelman, Jr., who graduated from the Philadelphia College of Pharmacy in 1898, and into whose hands the control of the store passed several years ago. He joined the college in 1859, the same year that some of our most distinguished pharmacists, who are now deceased, became members, viz., Prof. John M. Maisch and Robert England.

The report of the Committee on Membership was read by Prof. Charles H. LaWall, chairman. He said: "The committee has been considering revising the roll of membership. A number of them are in arrears and are liable to forfeit their membership. A plan was proposed to meet this condition, which the Secretary was directed to carry out."

The report of the delegates to the New Jersey Pharmaceutical Association was given by Professor Remington, chairman. He said the Association met at Long Branch. There was a good attendance; the meeting was full of life; they were an active and energetic set of men in the Association; it was the most successful meeting for years. The Association is also in good financial condition, and the entertainment which was provided was excellent.

The delegates to the Delaware Pharmaceutical Association reported through Dr. A. W. Miller, chairman. In his absence the report was read by the Secretary:

"The meeting was held on June 1, at the Hotel DuPont, in Wilmington, Del. The fraternal greetings and cordial good wishes of the college were presented, and the members were urged to send their students. The meeting was a small one, perhaps not more than twenty-five or thirty members being present, although at the subsequent luncheon there were probably double this number, on account of the ladies coming in. Only one business session was held, lasting about 2½ hours, after which we were invited to an inspection of the new City Hall and Court House."

The delegates to the Pennsylvania Pharmaceutical Association presented a verbal report through Prof. F. P. Stroup: "The meeting held at Reading was the largest held in recent years, thus proving the wisdom of meeting in the cities or larger towns rather than at summer resorts. Five members of the faculty of the college and a large number of its graduates were among those in attendance. The papers presented were interesting, as in former years. The weather was favorable, the entertainments were very good, and the hotel accommodations excellent. One of the very good effects of the meeting was the influence on the Reading druggists, they becoming consolidated and better known to each other than ever before. The Association meets in Pittsburgh next year."

The proposed amendment to Article VIII, Section 1, of the By-laws, offered at the annual meeting and laid over, was then considered and adopted, as follows: "Article VIII, Section 1.—Any person approving the objects of the college and its code of ethics may be elected an active member."

Dr. P. S. Stout, for the Committee on Centenary Celebration, stated that up to this time $8000 had been subscribed to the fund and about 20 per cent. paid in.

President French read a report of a recent meeting of the committees on the Fiftieth Anniversary Alumni Celebration (see p. 336 of this JOURNAL).

The discussion that followed the reading of the report was interesting and took a wide range. The discussion was participated in by Messrs. Beringer, French, Kraemer, Stroup, and Remington. As a result of the discussion Mr. Beringer moved that a committee of the college be appointed to coöperate or act in conjunction with committees now at work from the New York Pharmaceutical Association, the New Jersey Pharmaceutical Association, and the American Pharmaceutical Association in providing entertainments at the coming meeting of the A. Ph. A. It was so ordered, and the President appointed Prof. Joseph P. Remington, George M. Beringer, Henry Kraemer, Dr. Mitchell Bernstein, and Dr. P. S. Stout.

Dr. Stout alluded to the various prizes given by the college, and suggested that a list of such prizes should be posted in the corridor, as it would prove an incentive to more diligent application on the part of students in their studies. The suggestion was favorably commented on and, on motion, agreed to.

The President appointed the following committees:

On Nominations: Joseph W. England, Warren H. Poley, F. P. Stroup, Dr. Mitchell Bernstein, and Dr. P. S. Stout.

Committee on Necrology: Henry Kraemer, Joseph W. England, and C. A. Weidemann.

Delegates to the meeting of the American Pharmaceutical Association to be held at Atlantic City, N. J., September 5–9, 1916: Prof. Henry Kraemer, Prof. Frank X. Moerk, Prof. Charles H. LaWall, Prof. E. Fullerton Cook, Prof. Freeman P. Stroup, with power to fill vacancies.

C. A. WEIDEMANN, M.D.,
Recording Secretary.

ABSTRACTS FROM THE MINUTES OF THE BOARD OF TRUSTEES.

March 7, 1916.—Seventeen members were present.

The Committee on Instruction reported at length relative to changes in the course of instruction, and proposed a number of recommendations, as follows:

That theses be required from students desiring to graduate with the degree of Phar.D.

That the position of Professor Emeritus of Chemistry be created, and that Prof. Samuel P. Sadtler be elected. Professor Sadtler expressed his appreciation of the honor bestowed upon him.

Both of the above recommendations were adopted.

Mr. Mulford spoke of some of the advantages of student government, and moved that the Committee on Discipline and the Committee on Instruction consider the matter. It was so ordered.

Mr. French stated that the College had been invited to participate in the Philadelphia "To-day and To-morrow" Civic Exposition, to be held in the Commercial Museum, May 15 to June 10, 1916. The subject was referred to the Committee on Announcement to investigate and report.

The Chairman referred to the appropriation asked of Congress for the pedestal for the Procter Monument. The Dean explained the present situation, and suggested that a committee be appointed, representing the College, to coöperate with the National Committee. Being so ordered, the Chair appointed Messrs. Howard B. French, Joseph W. England, Edwin M. Boring, Henry K. Mulford, and O. W. Osterlund.

April 4, 1916.—Eighteen members were present.

A communication was received from the Secretary of the College, reporting the election of officers at the annual meeting of the College, held March 27, 1916 (see pp. 232 and 233 this Journal).

The election of chairman and vice-chairman of the Board of Trustees and registrar for the ensuing year being in order, the following were elected: George M. Beringer, chairman; Walter A. Rumsey, vice-chairman; Jacob S. Beetem, registrar.

Committee on Finance reported the desire of the Treasurer to be bonded, and also moved that this be done at the expense of the College, and, further, that the matter be referred to the Committee on Finance. It was so ordered.

Committee on Instruction reported further relative to the new course in the standardization of drugs. Several titles had been proposed for this course, but none as yet had been selected.

A report was also made relative to the course of instruction to be given students for the Phar.D. degree, and also to the filling of the position of Professor in Chemistry.

The committee recommended the election of Dr. Paul S. Pittenger as instructor in the course of Standardization of Drugs. On motion it was so ordered.

Committee on Examinations reported the name of Chester L. Masser as having successfully passed his examination and that he was, therefore, entitled to receive the Certificate of Proficiency in Chemistry. On motion the certificate was duly awarded.

Committee on Announcement reported that the appointment of a publicity agent had been considered. The committee further reported in favor of making an exhibition at the Philadelphia "To-day and To-morrow" Civic Exposition. The recommendation was approved and an appropriation was made to cover the necessary expenses.

The Chairman announced the standing committees for the ensuing year. The following were named chairmen of the various Committees:

Howard B. French, Property Committee.
Samuel P. Sadtler, Library Committee.
O. W. Osterlund, Museum and Herbarium Committee.
Howard B. French, Finance Committee.
H. K. Mulford, Supplies Comimttee.
George M. Beringer, Instruction Committee.
C. A. Weidemann, Accounts and Audit Committee.
Joseph P. Remington, Scholarship Committee.
William L. Cliffe, Examination Committee.
Joseph W. England, Theses Committee.
Howard B. French, Discipline Committee.
Joseph W. England, Announcement Committee.
Walter A. Rumsey, Commencement Committee.
Joseph W. England, Alumni Committee.

Appropriation Committee, the chairmen of all committees empowered to make expenditures, the chairman of the Board, the chairman of the Committee on Finance, and the Treasurer.

April 17, 1916.—Adjourned meeting. Fifteen members were present, and Prof. Frank X. Moerk, although not a member of the Board, was also present.

Committee on Instruction.—Supplemental report. The various recommendations were acted upon seriatim, as follows:

Recommended that the title of the course in Standardization of Drugs be called "Biologic Assaying." This was adopted.

The recommendation relative to the Phar.D. course and B.Sc. course was approved and referred to the Committee on By-Laws.

The change in the award of the Kappa Psi prize was approved.

The new prize in Dispensing Pharmacy, offered by Prof. E. F. Cook, was accepted and approved.

The changes in the various prizes made necessary by the Ph.G. course were approved.

Mr. C. J. Zufall was appointed Instructor in Botany and Pharmacognosy for the ensuing year. His services are to begin June 1, 1916.

The resignation of Mr. W. F. Haase as student assistant was, on motion, accepted.

Committee on Announcement reported relative to the selection of a publicity agent, and recommended the election of Mr. J. R. Graham for the ensuing year, which was approved.

Mr. French announced that he had secured from the Commercial Museum 15,000 botanical specimens. The thanks of the Board were extended to Dr. W. P. Wilson, director of the Commercial Museum, for the gift.

May 2, 1916.—Eighteen members were present.

Committee on Instruction has continued its meetings and has mapped out the curriculum for the post-graduate courses, leading up to the degree of Doctor in Pharmacy (Phar.D.) and Bachelor of Science in Chemistry and Pharmacy (B.Sc.). The outline for these courses has been practically completed for the Announcement.

The committee recommended that the fee for the Bachelor of Science degree be made $150 per year for each of the four years' instruction. This was approved.

The committee also recommended the establishment of a course in pharmaceutical arithmetic as a department of instruction in the College, and further recommended that Mr. Ivor Griffiths, P.D., of 1912, be engaged to give this instruction. This was approved.

Committee on Examination presented a report from Prof. John A. Roddy, Professor of Bacteriology, giving the names of those students who had satisfactorily completed the special course in Bacteriology. On motion, it was ordered that the Certificates be awarded (see p. 333 of this JOURNAL).

Committee on By-Laws offered an amendment to Article VIII, Section 4, which, according to the rule, was laid over for one month.

Professor Sadtler asked for a consideration of the election of his successor, when, after a general discussion of this important matter, Prof. Freeman P. Stroup was appointed Acting Professor of Chemistry for the session 1916–'17.

Mr. Beringer moved that Professor Stroup select an assistant for the Department of Chemistry, subject to the approval of the Board. It was so ordered.

May 31, 1916.—Special meeting. Fourteen members were present. Regrets were received from four members of the Board.

Committee on Examination presented the names of those who had successfully passed the examinations and were entitled to receive the degree of Doctor in Pharmacy (P.D.). A vote was taken and Mr. Poley, who acted as teller, reported the ballot clear. The Chairman then declared those named elected to receive the degree of Doctor in Pharmacy (P.D.) (see July issue this JOURNAL).

The committee then read the list of candidates for the degree of Pharmaceutical Chemist (P.C.). A vote was taken and, the ballot being clear, the Chair declared them elected to receive the degree of Pharmaceutical Chemist (P.C.). (See p. 333, this JOURNAL.)

Six pharmaceutical chemists of former years having applied for the degree of Doctor in Pharmacy, and complying with the requirements of the College, were voted for and, the ballot being clear, were declared elected to receive the degree.

The names of those entitled to receive prizes were then announced.

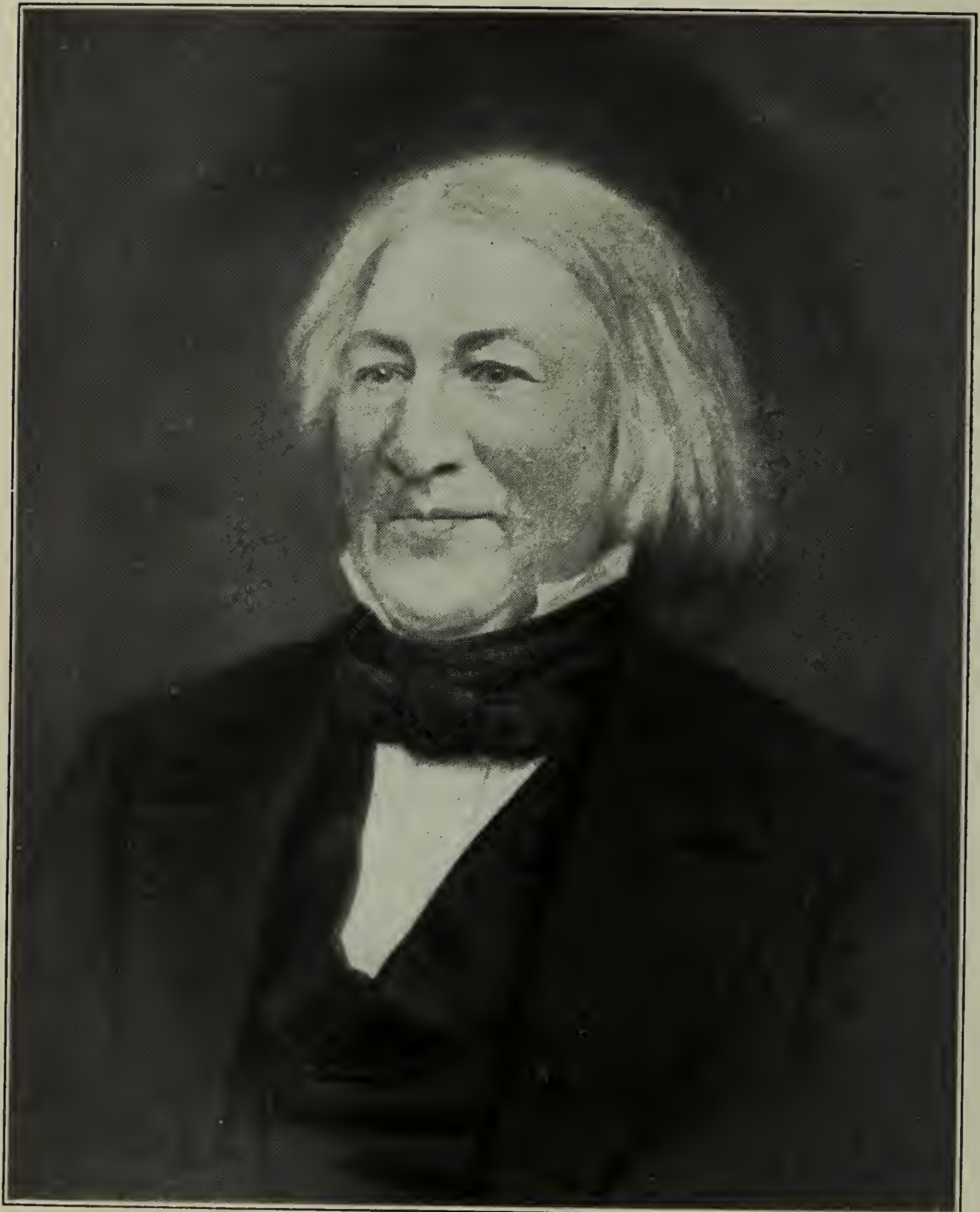
The Dean announced that Col. H. A. Demming offered a prize—a ruby, valued at $50—to be given to the student making the greatest improvement over the previous year. The awarding of this prize was to be left to the Committee on Examination.

The Dean also stated that Colonel Demming decided to establish a prize of $20 in gold for the best thesis on Mineralogy. The offer was accepted and the thanks of the Board tendered the donor.

The names of those appointed to present the prizes at the coming Commencement were then announced.

The committee further announced the names of Herbert Calvin Brightbill and Robert Rowen as having taken the full course in Analytical Chemistry, and, passing their examinations, were entitled to receive the Certificate of Proficiency in Chemistry. On motion the certificates were awarded.

Mr. French read a communication from Professor Stroup relative to the High School scholarships. After some discussion, it was voted that an invitation be sent, through the Board of Education, to each of the High Schools in Philadelphia, and the matter be left in the hands of the President.



Dr. Samuel Jackson
1787–1872

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SOME OF THE EARLY TEACHERS IN PHARMACOGNOSY IN AMERICA.

By Henry Kraemer.

I have been surprised, in looking over the files of the American Journal of Pharmacy, that there should not be a more or less detailed and complete account of the rise and development of Pharmacognosy in the United States. Furthermore, very few biographical notices of the great leaders in this subject that have been published give us any true concept of their work. I have been interested recently in gathering together such information as is available concerning the early teachers in Pharmacognosy, and have felt that it would be worth while publishing the facts. Carlyle has truly said that the history of any nation can be written from the biography of its great men. This is not only true of nations but of institutions and the subjects which comprise the special activities of man. Nearly all of the leaders in Pharmacognosy have been connected at one time or another with the Philadelphia College of Pharmacy. In the Museum of the College there is fortunately a splendid collection of oil-paintings which gives us some idea of the personality of these men. It is especially noteworthy that a number of them should have attained great renown while they were connected with the Philadelphia College of Pharmacy, and it is here that they gained their experiences and earned their reputations. It was customary in the earlier days of the college to select medical men for the Faculty, as it was said " that the pharmacists had none in their ranks to accept such important positions." It was not until the College was in existence for about fifty years that the Faculty included a number of successful teachers who were trained as retail pharmacists. This condition had not only a marked influence on the teaching in pharmacy in the United States but also on the work of the United States Pharmacopœia. It is well known that in the earlier editions of the U. S. Pharmacopœia the medical profession took a very great interest, and their members were active in the preparation of the text. This was later changed, due to a notable incident which occurred in connection with the 1840 revision of the U. S. Pharmacopœia. The Committee of Revision had prepared their report and it was ready by October, 1840, but concluded to defer all action until the Philadelphia College of Pharmacy should present their report. This communication was sent to them near the end of the year 1841, and the preface to the Pharmacopœia of 1840 refers to it as follows: " A committee of that body (the College of Pharmacy), charged with the work of revision, had, in the meantime, been zealously engaged in prosecuting the object of their appointment, and the result of their labors, having received the sanction of the College, was transmitted to the committee of the convention. This contribution from the Philadelphia College of Pharmacy consisted of a revised copy of the Pharmacopœia, elaborated with ability and great industry, and presenting, along with numerous individual additions and alterations, some new features in the general plan. It, therefore, required close attention and deliberate examination on the part of the committee, who found themselves under the necessity of going over the whole ground which they had recently traversed." From this time on the Colleges of Pharmacy were invited to send delegates to the U. S. Pharmacopœial conventions, and pharmacists were given a larger share of the work.

Dr. Samuel Jackson.

The Philadelphia College of Pharmacy was instituted on February 23, 1821, and the first Faculty, elected on April 23, consisted of but two professors, one of whom was Samuel Jackson, M.D., who occupied the Chair of Materia Medica and Pharmacy. In the first introductory lecture delivered at the College, and entitled " Conditions of Medicine in the United States, and the Means to Their Reform," Doctor Jackson struck the key-note to the situation. Could his ideals have been realized in part, and had the pharmacists of the United States consistently adhered to the principle laid down by him, conditions in pharmacy would have been very different from what they are to-day. We would not have felt, after the lapse of nearly a century, the necessity of reconstructing the practice of pharmacy to meet the needs of the public health. Doctor Jackson said: "The ultimate success of the Philadelphia College of Pharmacy must rest with the public and the physicians of the city and country. It must look to their patronage to crown its efforts. A determination on their part to limit all their business to the members of the College—to send prescriptions and purchase their supplies of those only who have made themselves amenable to its laws and act under its supervision and warranty—is all that is requisite to perfect the only plan by which in this country the secret and hidden danger of an unregulated and neglected pharmacy can be avoided. It is the vital spring that will give energy, movement, power, action, and permanency to the whole machine. A member of the College is not only under the common influence of conscientious motives and regard to his character, but he is under the government of artificial restraints. Liable to an accusation and trial for unfaithfulness in his business, expulsion would destroy his prospects, if the suggestions I recommended were generally adopted. He would then not hazard the danger, and the physician and patient could both rely on the exact observance of a prescription, and on the purity and good quality of the medicine administered or purchased."

Doctor Jackson was one of the most eminent practitioners and lecturers on medicine of his time, and this probably accounts for the fact that his life as also his work in the Philadelphia College of Pharmacy seems to have been overlooked. Fortunately, however, Prof. Joseph Carson wrote a discourse commemorative of the life and character of Doctor Jackson. This address was delivered before the trustees, professors, and students of the Univeristy of Pennsylvania, and subsequently published at the request of the medical students of the Univeristy. A copy of this address is in the library of the American Philosophical Society, and it is from this account that I present the facts concerning the life of this truly remarkable man.

Dr. Samuel Jackson was born in the city of Philadelphia, March 22, 1787. He acquired a classical education at the University of Pennsylvania, but does not appear to have taken any literary degree. He later studied medicine and received the degree of Doctor of Medicine from the University. After his graduation Doctor Jackson did not enter upon the practice of his profession. His father had been engaged in the business as a druggist and pharmaceutist, and, after his death in 1801, its continuance devolved on his eldest son. Upon the death of his brother, in 1809, Doctor Jackson continued the business, rendered necessary by the dependent state of the family. The details of trade, however, were never congenial to the tastes of Professor Jackson; he was clearly unadapted to such pursuits, and his aspirations took another direction. As soon as he could do so he abandoned the occupation of a pharmacist, and became a candidate for practice in the medical profession. To his credit it may be stated that when he retired from business, being deeply involved pecuniarily, he regarded all his obligations with a sense of honor, and subsequently liquidated them from his professional earnings, with principal and interest.

While engaged in business pursuits, the War of 1812 with Great Britain was declared. He manifested his patriotism by joining the "First Troop of City Cavalry," and with it took part in the advanced movements of the troops then raised to protect the city of Philadelphia from invasion by the British. In the autumn and early portion of the winter of 1814 he was occupied at Mount Bull, in Maryland, in watching the movements of the enemy, then in the waters of the Chesapeake, or in riding as a vidette between that post and the city. After the war had terminated, and peace had been declared in 1815, Dr. Jackson closed his business concerns, and by so doing placed himself on a footing with his compeers and brother practitioners in his native city.

Doctor Jackson had a public-spirited mind, and was interested in public health work. He became a member of the Board of Health of Philadelphia, and in 1820 was its president. His services in connection with the study and final suppression of the yellow fever epidemic in 1820 has become a part of the history of our knowledge and control of this disease. As has been already stated, Doctor Jackson was one of the first professors of the Philadelphia College of Pharmacy. During his first year he was associated with Dr. Gerard Troost, who held the Chair of Chemistry but one year, being followed by Dr. George B. Wood. This association with the latter is worthy of note, when it is recalled that Professors Wood and Jackson, in subsequent years, during a full quarter of a century, were colleagues in the University of Pennsylvania. The selection of Doctor Jackson to fill the Chair of Materia Medica in the College evidently depended on the estimate of his fitness from his former connection with the pharmaceutic profession, the deep interest he took in the success of the institution, and his share in organizing it.

He was the link, as it were, between the two professions, and from early training was supposed to be perfectly conversant with the requirements of each of them. That this was the case is evident from the whole tenor of the Introductory Lecture that he delivered upon entering on his duties.

At the period when the Philadelphia College of Pharmacy was organized the pharmaceutical profession was at a low ebb, not only in the city of Philadelphia but in the United States. When speaking of its condition, in the lecture referred to, he makes this bold and candid declaration: "As respects drugs and medicines, this country, for the last thirty years, has been retrograding rather than advancing. Abandoned by physicians, pharmacology has not been prosecuted as a science by the druggists and apothecaries; no means of instruction were provided for these last, no rules or regulations established for their government in order to insure a correct dispensation of medicines of the most improved and genuine qualities. Individuals engaged in the vocation of an apothecary and druggist without a previous acquaintance with medicines, ignorant of their properties, unconscious of their responsibility and of the fatal effects which might result from their conduct; anxious to transact business, they have sought to attract customers by the lowness of their prices. Their successes compelled others to come down to the same standard, and thus, by succesive competition, our drugs and medicines are cheaper than those of Europe, but are deteriorated in the same proportion." But this condition of things was not solely due to the pharmaceutist. "The great body of practitioners, especially those residing in the country, knowing medicines only by their names, have been ignorant of the very different qualities subsisting among them. In their purchases, incapable of making a selection as to quality, the lowest price was preferred. Inferior, deteriorated, and sophisticated medicines and drugs met with ready sale, while the choicest and most select, because of higher price, could very seldom meet with a purchaser."

The disheartening picture here presented has been erased, and that such would be the case was predicted by the lecturer. His words were prophetic: "In the United States, pharmacology is a new science. Long repudiated from medical instruction, too feeble to assert its claims, neglected, and almost forgotten by its more brilliant sister sciences, it has pined in penury and obscurity. This reproach and stain upon the medicine of our country will soon be effaced. For proof that this anticipation has been realized, we may proudly survey the present condition of this department throughout the length and breadth of our extended country. The influence of the Philadelphia College of Pharmacy, through its instruction and through its JOURNAL, has been felt in every quarter. It was the pioneer; and other colleges of similar organization have sprung up, in imitation, at the great centres of wealth and population. The people have been instructed as regards their utility and importance. Coöperation has been effected, and an association among pharmaceutists has been created—the 'American Pharmaceutical Association' —which is eminently useful. A Pharmacopœia, whose origin was coeval with the College of Pharmacy, and in which the pharmaceutists are as much interested as are medical men, has become the national standard. Our pharmaceutists may now be ranked among the best instructed of the world.

"To whom may be attributed the early planting and nourishment of this intellectual germ which has yielded so plentifully, and has been of such incalculable benefit to the community? The record shows that this was due to the talents, learning, energy, and industry of two members of the medical profession, both subsequently professors in the University of Pennsylvania, Samuel Jackson and George B. Wood; and, further, for the first twenty-five years in the history of the College the duty of instructing its pupils was intrusted to members of the same profession. I wish not to derogate from the merit of those enlightened druggists and apothecaries who were coadjutors in the work of founding the College of Pharmacy. They well appreciated the abilities of those who only at the time could subserve their purpose of instruction, and nobly supported them until eminent members of their own profession arose to carry on the enterprise so happily inaugurated."

While holding the Chair of Materia Medica and Pharmacy in the Philadelphia College of Pharmacy, Doctor Jackson joined the association which was organized by Doctor Chapman for the instruction of the pupils of the University of Pennsylvania, who remained in the city during the recess between the public course of lectures. So many subjects claimed the attention of Doctor Jackson that he resigned his position at the Philadelphia College of Pharmacy on May 24, 1827. From this time on he devoted all of his energies to the practice of medicine, and contributed much to the advancement of medicine, becoming connected with the University of Pennsyl-

Benjamin Ellis
1798–1831

vania and devoting much of his time as one of the attending physicians of the Philadelphia Almshouse. He was for 36 years connected with the University of Pennsylvania, and for 28 years was a full professor. He died April 4, 1872, at the age of 85. He played a conspicuous part in the development of medical education, and his whole-souled devotion to public health work has linked his name with that of the greatest medical men of his time. He was the author of many original papers and addresses; most of these were on medical subjects. There is one, however, which is published in the JOURNAL OF THE PHILADELPHIA COLLEGE OF PHARMACY for May, 1826, on "James's Fever Powders." The introductory lecture which he delivered in the Philadelphia College of Pharmacy on "Conditions of Medicine in the United States, and the Means to Their Reform" was published in the *Philadelphia Journal of the Medical and Physical Sciences,* vol. v, No. 2, 1822.

Doctor Jackson's name is connected with three preparations which were used as popular remedies, *viz.,* Jackson's Pectoral Syrup; Jackson's Ammonia Lozenges; and Jackson's Pectoral and Ammonia Lozenges. The original formulæ are given in the AMERICAN JOURNAL OF PHARMACY, 1852, pp. 34–36. Doctor Jackson's name is also connected with an iodine solution called "Lugol's Diluted or Jackson's Iodine Solution," which is quite similar to the compound solution of iodine now official (AMER. JOUR. PHARM., 1834, p. 116). At one time there was largely used a "dissolving salve for breasts" which is made according to a formula devised by Professor Jackson (*Ibid.,* 1864, p. 116).

DR. BENJAMIN ELLIS.

Benjamin Ellis, who succeeded Doctor Jackson, was elected Professor of Materia Medica on June 25, 1827. He was one of the originators of the AMERICAN JOURNAL OF PHARMACY, and was the editor when its original publication began in 1829.

He gave every evidence of a very promising career and was cut off in the flower of life, dying at the age of 33. There is an excellent biographical sketch of him in the AMERICAN JOURNAL OF PHARMACY of 1831, p. 345. The sketch was prepared by Dr. E. H. Coates and read before the Philadelphia Kappa Lambda Society. Dr. Benjamin Ellis was born in Muncy, Pennsylvania, May 5, 1798. His early education was in strict conformity with the opinions of the religious Society of Friends. Part of his early education was obtained in the seminary at Manhattanville, near New York. He seems to have been especially interested in the languages and in the study of chemistry. Very early in his career he established a reputation as being proficient in materia medica, and he then became interested in medicine and obtained his degree at the University of Pennsylvania. He gave four courses of lectures in Materia Medica at the College of Pharmacy, and contributed a number of articles to the AMERICAN JOURNAL OF PHARMACY. These articles did not show any great originality, as they were mostly translations from foreign sources. Some of these contributions, as on Rhubarb, Chinese Materia Medica, and Liriodendron Tulipifera, are even to-day worthy of examination. His most important work, however, was in connection with the AMERICAN JOURNAL OF PHARMACY. The first venture, from 1825 to 1829, was not very successful, but Professor Ellis was very earnest and persevering in his efforts for the continuation of the JOURNAL, and the results of his able editorship are seen throughout those early numbers. Doctor Ellis was not a strong man physically, and yet his life was marked by unwearying and presevering industry. He was a man of fine character, and just the type of man to help establish an institution such as ours. He found time to write a medical formulary, which was the most successful of the works of this nature that have ever been published in the United States. It ran through eleven editions, the last being edited by Professor Thomas, in 1864, a few weeks prior to his death.

The following papers were published by Professor Ellis in the AMERICAN JOURNAL OF PHARMACY.

"The Price and Consumption of Opium," November, 1827, p. 110.

"Seidlitz Powders," September, 1827, p. 81.

"Chinese Materia Medica," 1830, p. 150.

"On Weights and Measures," 1831, p. 111 and p. 188.

"On the Liriodendron Tulipifera, American Poplar or Tulip Tree," 1831, p. 11.

PROFESSOR GEORGE B. WOOD.

Dr. George B. Wood was the third Professor of Materia Medica. He was the uncle of our distinguished honorary member, Dr. Horatio C. Wood. Doctor Wood was Professor in Chemistry from 1822 to 1831, prior to his transfer to the Chair of Materia Medica, to which he was elected on May 24, 1831. He is conspicuous for his work with Doctor Bache on the United States Dispensatory and

Dr. George B. Wood
1797–1879

for his services during four decades and five revisions of the United States Pharmacopœia, he being a member of the first pharmacopœial convention. In a memoir of Doctor Wood which was read before the American Philosophical Society, October 11, 1880, Doctor Hartshorne pays this tribute to him. He says: "With a long life, not much varied in events, nor brilliant in deeds that meet the public eye, Dr. George B. Wood may be named as one who, in the main features, and, indeed, in almost every particular of his career, has left an example worthy of admiration and emulation. It will be acknowledged by the least enthusiastic of his friends and associates that he was one of the most useful men of his generation." He was born in Greenwich, Cumberland County, N. J., March 13, 1797. His parents were Friends. His early education was obtained in New York, but was completed at the University of Pennsylvania, where he was graduated with honors in 1815. He wrote, between 1813 and 1825, many verses, mostly in English, some in Latin—among the former several translations from the German of Schiller. He even planned and wrote the greater part of a novel which, however, was never published. Soon after graduating from the University, he studied medicine under Dr. Joseph Parrish and graduated in medicine, receiving his degree in 1818. With Doctor Parrish he developed a private medical school, and it was here that he matured those convictions upon practical medicine and medical ethics which he inculcated through his whole life, and it has been said that no man prior to his time did so much to form and influence medical opinion in America upon both practical and ethical questions.

He was an earnest student and became one of the most eloquent and successful lecturers of his time. It is said that these qualities were not due to any natural gift, but rather to assiduous study and cultivation of his powers.

As has already been stated, he first became associated with our College in 1822 as Professor of Chemistry. His knowledge of many subjects was such that he might easily have filled with distinction any number of other positions. It was but natural, because of his interests in therapeutics, that he should have made for himself a reputation in materia medica. His articles on the history of materia medica, and especially of this subject in the United States, are very important contributions to our knowledge of the uses of drugs. His addresses at the Philadelphia College of Pharmacy, two of which were published, are of exemplary character. I have a volume of nearly 500 pages devoted entirely to the lectures and addresses on pharmaceutical and medical subjects delivered by Doctor Wood.

During the time that Doctor Wood was connected with our College he laid the foundation and developed some of his most important work. His labors on the Pharmacopœia were most unselfish. He himself stated that in 1829 he devoted all of his leisure for nine months, in connection with his colleagues comprised in a special committee of the College of Physicians of Philadelphia, in revising the Pharmacopœia of the United States. So many alterations were found to be required that it was necessary to rewrite almost the whole work. Before the committee was satisfied, Doctor Wood had written almost all of the manuscript copy at least twice over with his own hand. The thoroughness of this work was largely due to Doctor Wood, and his personality had much to do with its being adopted as the standard authority throughout the United States. It was but natural for one who had been so painstaking in this work to see the possibility and desirability of an elaborate commentary on the Pharmacopœia. Soon after the Pharmacopœia of 1830 was published Doctor Wood, in conjunction with Prof. Franklin Bache and aided for a time by Daniel B. Smith, then president of the Philadelphia College of Pharmacy, worked upon the United States Dispensatory. This volume of more than 1000 pages was begun and finished by its authors in less than two years. This has been the most successful work on pharmacy published in the United States. During the next fifty years of Doctor Wood's life it ran through 14 large editions, and it is estimated that 120,000 copies were sold. The publication of this work and its success are the most interesting chapters in the literature of the medical and pharmaceutical profession. While Doctor Wood was connected with the University of Pennsylvania, his associate, Professor Bache, was connected with a rival medical institution, Jefferson Medical College of Philadelphia. It reveals not only a breadth of mind of these two authors but their great characters in uniting for a common purpose to supply their profession with the best information available. It is very doubtful if the later editions of this work have commanded the esteem and accomplished what the earlier revisions did for the combined professions.

In 1835, Doctor Wood was elected to the Chair of Materia Medica and Pharmacy in the Medical Department of the University of Pennsylvania and resigned his position in the Philadelphia College of Pharmacy. It was here that the fruits of his earlier life were ripened, and it was from this time on to its close that he reached the culmination of his reputation as a teacher. Doctor Wood revolutionized the method of teaching during his time. His courses of lectures upon Materia Medica may be truly said to have been splendid, almost magnificent; adorned as well as made complete for the students' information by the exhibition from day to day of living specimens of medicinal plants from all quarters of the world, grown in his own private conservatory and botanical garden maintained for this special purpose. When such at the time could not be obtained, fine pictorial representations were placed before the class in their stead; and his cabinet of mineral and other crude and prepared specimens was correspondingly complete. A printed syllabus of the course of lectures, interleaved for note-taking, was furnished gratuitously by him to each student. It may be said, indeed, that no portion of the curriculum of the Medical Department of the University, able and renowned as have been the other members of its Faculty, ever added more to the great reputation and the large classes of that institution, than this model course. Doctor Wood continued to hold the Chair of Materia Medica and Therapeutics until 1850, when he was transferred to that of the Theory and Practice of Medicine, upon the retirement from the latter of Prof. Nathaniel Chapman. This chair he retained until 1860, when he withdrew from all active labors. During the remaining twenty years of his life he devoted his energies for the benefit of his profession and his fellows. In 1859 he was elected president of the American Philosophical Society, which position, with that of the presidency of the College of Physicians and Surgeons, he held until the time of his death, in 1879. Doctor Wood's mental outlook was far from being narrow or in any sense restricted to matters connected with his own profession. He was earnestly and actively interested for several years in the establishment of Girard College according to the designs of its endowment. He became interested in the Temperance Reform, and contributed to the *United States Review* an article of about fifty pages on the temperance cause. He also wrote an article on the "History of Christianity in India"; this was part of a larger plan of his to write a work on the history of India. He conducted a number of agricultural experiments. At his farm at Greenwich he spent several years in experimenting on the fertilizing and renewing action of potassium on the growth of fruit-trees, potatoes, wheat, and other plants. The addition of wood ashes empirically to certain soils under cultivation has long been a common practice in many places. By the chemical analysis of plants and of the earth in which they grow, as Doctor Wood mentions, their mutual physiological relations, especially since the investigations of Liebig, have been generally understood. But the merit of Doctor Wood's observations is that they have furnished means of definite experimental demonstration, upon a considerable scale, of the practical application of this part of the chemical physiology of plants, in a manner productive of direct agricultural and horticultural profit.

Doctor Wood was a remarkable man and one of the most influential of his time in Philadelphia. In person he was rather tall; until the last few years of his life slender, and his features were regular, though not striking; he wore a peruke and no beard. He was always dressed in black, and very neatly. His manners were dignified and formal; his whole appearance grave and sedate. To strangers and those of slight acquaintance he seemed rather to repel approach, and to produce a feeling of constraint. Among intimate friends, however, in social intercourse, this severity was relaxed; so that, although never demonstrative, he was quite affable, and at times genial. As Doctor Packard describes him, in his brief biological sketch, "Whoever learned to know him found in him a faithful friend, a judicious counsellor, and a true man." His uniform courtesy entitled him to be designated, as he was at the dinner given to him by the profession in 1860, "the model gentleman." Using again some of the words of Doctor Littell, "His purity was that of the snow or lily; and no one in his presence ever ventured to indulge in ribald jest or unseemly remark." His conversation was agreeable and often very instructive, though not brilliant. Doctor Hartshorne says that "twice only, in very frequent professional and social intercourse, did I hear him utter a facetious remark; and then it was rather the dry wit which brings a smile than the humor which compels laughter." One of Doctor Wood's early formed habits, not uncommon, perhaps, with toilsome authors, was that of doing most of his literary work late at night. From ten o'clock until two, three, or four in the morning were his usual hours for such employment. So inveterate did this become, as a "second nature" with him, that when in advanced age he laid his pen almost entirely aside, he found it impossible to return to ordinary hours. He was still obliged, almost to the last, to turn night into day, and day into the time of his repose. Doctor Wood was benevolent, giving to both public and private institutions. He gave liberally to the University of Pennsylvania, The Pennsylvania Hospital, College of Physicians, The American Philosophical Society, and the Academy of Natural Sciences, and several of these institutions became principal legatees of his wealth. He was honored by being made either honorary or corresponding member of a number of societies in this country and abroad. In 1848, as a delegate to the meeting of the British Medical Association, he was received with unusual distinction. "When his credentials were read, complimentary resolutions were passed and the whole assembly rose to greet him, as the accredited and honored representative of his profession in America. During his last visit to England, in 1861, appropriate official and social courtesies were extended to him, as president of the American Philosophical Society, and of the College of Physicians of Philadelphia, by the officers and members of the Royal Society and of the College of Surgeons and Physicians in London." The record of Doctor Wood's life is fascinating and reads like a novel. He enriched his profession by his wonderful powers of exposition. He contributed nothing which was new to his science, and left nothing of a permanent character that the student of research could point to as a step or landmark in the development of science. As we scan the biographies of men, they may be divided into two classes: the ones who influence their immediate environment and whose character is appreciated by those who come in contact with them. There is a second class, viz., those who are able to penetrate deep into nature's secrets and find out her laws; it is the latter who are the great masters of knowledge and whose character is appreciated by the world's greatest souls in every clime and for all time. It is no disparagement to Doctor Wood to say that he belonged to the former class, in which are enrolled many men who have enriched the world by their dissemination of the knowledge which has been hewn out of nature by others.

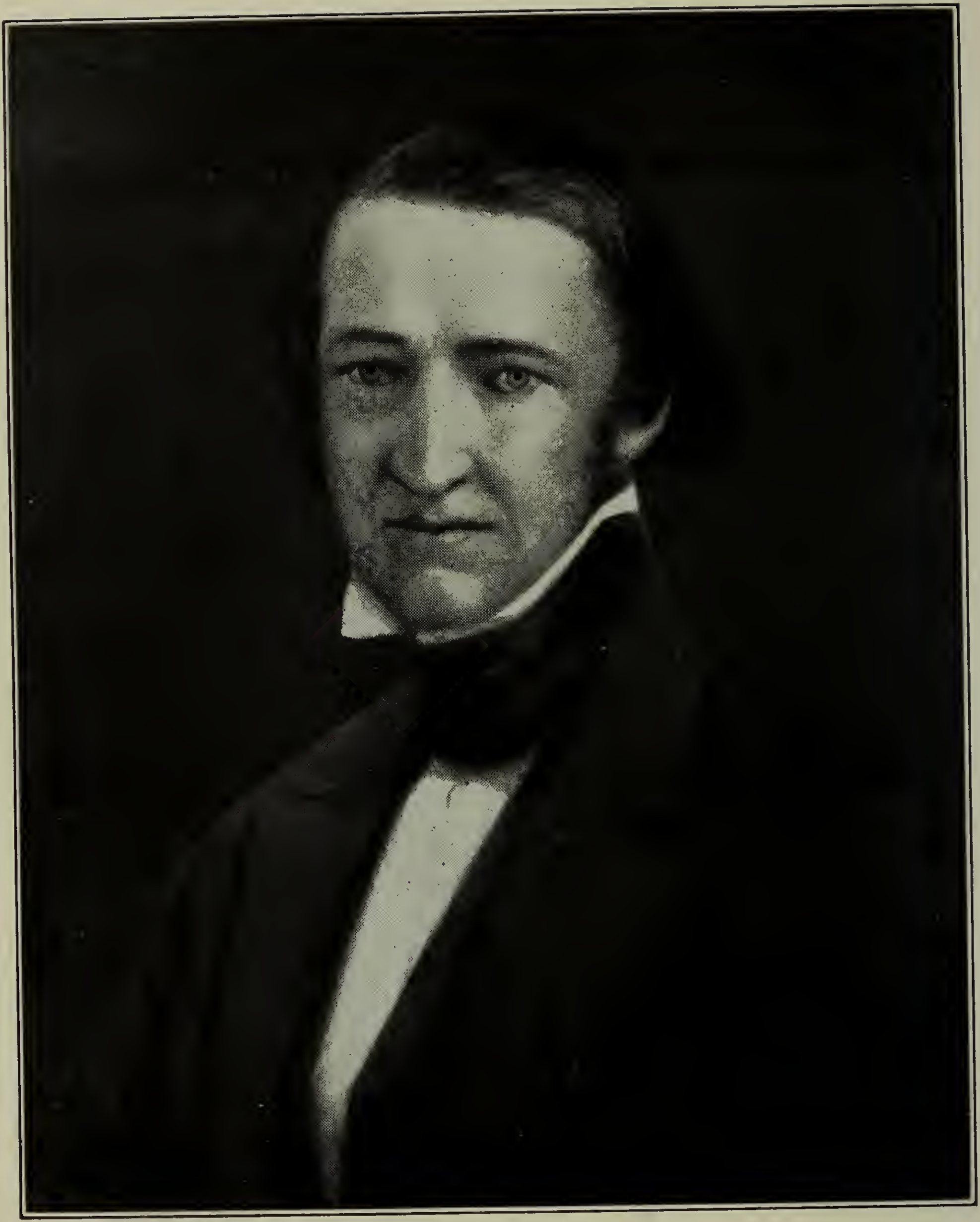
There is a story which concerns Doctor Wood as related by Professor Minot in his lecture on Joseph Leidy. The authenticity of this we cannot vouch for, for as a young man I recall how the same story was told in which the name of Dr. William Pepper, then the eminent provost of the University, was substituted for that of Doctor Wood. It would seem to be a kind of a tale of the street which could be used effectively to belittle the influence of a useful member of society rather than add to the reputation of the great scientist Leidy. The story, as told by Prof. Minot (*Science*, May 30, 1913, p. 813), is an incident which happened when Doctor Wood is said to have taken with him, on one of his European trips, Dr. Joseph Leidy, Philadelphia's greatest scientist and one of the world's greatest men. Doctor Wood possessed all of the credentials of the learned societies of Philadelphia, and, as he was anxious to collect materials to illustrate his lectures, had no hesitation in calling upon many of Europe's most eminent men. In conjunction with Dr. Leidy, Dr. Wood called on Prof. Johannes Müller, one of the world's greatest physiologists. It is said that Doctor Wood found it difficult to overcome Doctor Leidy's modesty in sending up his card to Professor Müller. He did so, however, and when Müller came into the room he asked, "Which is Leidy?"

Dr. Wood died on March 30, 1879, at the age of 82. According to Dr. Littel, "his remains, followed by a long train of sorrowing friends, were silently interred at Laurel Hill as the manner of Friends is to bury. Not a word was uttered, not a note was heard, either at the house or at the grave. All instinctively felt that fulsome panegyric or trite remark would be alike out of place on such an occasion. They came 'to bury Cæsar, not to praise him.' But though no religious rite was observed, no comforting service performed, those who were present felt none the less deeply that the object of their love and veneration—the Christian gentleman, the representative physician, the knight of stainless record—had been gathered to his fathers after a well-spent life, ripe with years and honors, 'in the confidence of a certain faith, in the comfort of a reasonable, religious, and holy hope, in favor with God, and in perfect charity with the world.'"

As has already been stated, Doctor Wood's writings were voluminous; though relatively few of his papers were published in the American Journal of Pharmacy. Of the latter the following may be mentioned.

"Dissertation upon the Subject of Peruvian Bark," 1831, pp. 22, 96.

"Observations on Certain Preparations in the Pharmacopœia of the United States," 1831, pp. 200, 292; 1832, p. 94.



Dr. Robert E. Griffith
1797–1850

"Introductory Lecture to the Course on Materia Medica and Pharmacy in the University of Pennsylvania," session 1835–'36, 1835, p. 286.

"Introductory Lecture to the Course of Materia Medica in the University of Pennsylvania," 1840, p. 298.

"On the Preparation of Mercurial Ointment," 1852, p. 111.

PROF. ROBERT E. GRIFFITH.

Robert Egglesfield Griffith was the fourth teacher of Pharmacognosy. He held the chair but for one year and delivered a course of lectures during the term of 1835–'36. His work in connection with the College extended over a longer period, as upon the death of Dr. Benjamin Ellis he assumed the editorship of our JOURNAL, and it was during this time, by reason of his original papers on medicinal plants, he made a reputation for the JOURNAL which it still maintains. During these five or six years he published nearly 90 articles in the AMERICAN JOURNAL OF PHARMACY, a record that has never been equalled or surpassed by any one connected with the College. He resigned his position at our College in 1836 to accept a similar position in the University of Maryland. He stayed there only a few years, accepting a position in the University of Virginia. On account of ill health he was compelled to relinquish his University work, and went to the West Indies. He returned to the United States and occupied himself with experimental agriculture near Baltimore. He afterwards returned to Philadelphia and devoted himself to literary pursuits, chiefly of a medical and botanical character. During this period "Griffith's Medical Botany" and "Griffith's Universal Formulary," both original works, issued from his pen, and several foreign works were republished here under his supervision, the most prominent of which was "Dr. Christison's Materia Medica." I should like to refer to this work on medical botany of Doctor Griffith's. It comprises nearly 700 pages and is dedicated to Torrey and Gray, with whom he had a lasting friendship. At this time there was no book of an authoritative character which was in general use. The works of Bigelow and Barton on vegetable materia medica were out of print, while the "Medical Flora" or Rafanesque contained a number of misleading statements. It is true that there were a number of other works that attempted to supply this deficiency, but none of them were based on botanical principles and especially intended to elucidate the vegetable materia medica. The basis of this work was no doubt laid while he was connected with the Philadelphia College of Pharmacy. The work is quite well illustrated with line drawings, and contains much valuable information on the characteristics of drugs and the plants yielding them. It is not a compilation, but the product of a master mind. On every page there is revealed careful work, and it is a credit to the author.

"Griffith's Universal Formulary" was a compendious collection of formulæ and pharmaceutical processes. While not the first one to be prepared,—the first being the work of Dr. Benjamin Ellis—it was very successful, and was later edited by Thomas and Maisch and was for more than thirty years a standard work.

Doctor Griffith was an eminent scientist, well known for his work in conchology, and was one of the vice-presidents of the Academy of Natural Sciences. He had a true scientific mind and may be considered the pioneer in American Pharmacognosy. He numbered among his friends not only the foremost minds in America but many of the learned men of Europe. His mind was a vast storehouse of knowledge; he was a close observer and most indefatigable student. He had a very retentive memory, and his information was accurate on every occasion. He was always ready to assist his colleagues in their studies, and rendered any possible assistance to further the cause of science. He died in the prime of life, at the age of 53.

Doctor Griffith was a voluminous writer of not only original articles but of current literature. He was well informed on a large variety of subjects, and always wrote from an original point of view.

The following articles appeared in the AMERICAN JOURNAL OF PHARMACY during a period of ten years from 1831 to 1840:

"Notes on Ipecacuanha," 1831, p. 181.

"Pharmaceutical Notices," 1831, p. 196; 1832, p. 199; 1835, p. 283.

"Frasera Walteri," 1832, p. 269.

"Spigelia Marilandica," 1832, p. 2.

"Notes on Hydrocyanic Acid," 1832, p. 17.

"Geranium Maculatum," 1832, p. 89.

"Gillenia Trifoliata," 1832, p. 177.

"Cacoucia Coccinea," 1832, p. 186.

"Vegetable Emetics of the United States," 1832, p. 276.

"Note on Œnothera Biennis," 1832, p. 289.

"Acorus Calamus," 1833, p. 265.

"Medico-Botanical Notes," 1834, pp. 299, 21, 118, 199, 284; 1835, pp. 115, 187, 279; 1836, pp. 19, 101, 191.

"Vegetable Tonics of the United States," 1834, p. 284.

"Eupatorium Perfoliatum," 1834, p. 1.

"Conium Maculatum," 1835, p. 267.

"Melia Azedarach," 1836, p. 176.

(To be continued)

MEDICATED WATERS.[1]

By John K. Thum, German Hospital, Philadelphia.

The Pharmacopœia contains 17 medicated waters, of which six are made from volatile oils, and five of these by triturating the volatile oil with purified talc, gradually adding the required amount of distilled water, and filtering. Medicated waters made in this manner are very unsatisfactory; for the first few days they show up fairly well, but from then on they rapidly change for the worse, so far as appearance and pleasant flavor obtain.

Now the United States Pharmacopœia does not insist that these waters must be made according to this procedure, as the following quotation clearly shows:

"The Medicated Waters, when prepared from volatile oils, are intended to be, as nearly as practicable, saturated solutions, which must be clear, and free from solid impurities. In the processes which follow, the solution of the volatile oil is facilitated by the use of purified talc; but the solution may, if preferred, be aided by replacing the purified talc by pulped or shredded filter-paper; waters may also be made by the addition of volatile oils to hot water and separation of the excess of the former, or by the distillation of the drug or volatile oil with water, if by either of these methods the finished product corresponds in all respects with official requirements."

Bitter almond water is directed to be made by dissolving the oil in distilled water by agitation and filtering through a wetted filter-paper; no mention is made of using hot water. By this method a water is obtained that looks well and retains its appearance indefinitely. Creosote water is directed to be made in the same manner, and chloroform water in a manner that is somewhat similar; in this case the procedure is as follows: Add enough chloroform to a convenient quantity of distilled water, contained in a dark, amber-colored bottle, to maintain a slight excess of the former after the contents have been repeatedly and thoroughly agitated. When required for use, pour off the needed quantity of the solution, refill the bottle with distilled water, and saturate it by thorough agitation, taking care that there be always an excess of chloroform present.

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[1] Read at the annual meeting of the Pennsylvania Pharmaceutical Association, June, 1916.

In 1913 the writer presented a paper in which he advocated the making of camphor water by agitating small pieces of camphor with distilled water in a bottle and replenishing the dispensing bottle by pouring through a piece of gauze tied over the neck of the stock bottle. He is still wedded to that method of making camphor water. Success with this method naturally led to experiments with the other medicated waters, and it was found that fine waters, that remain clear indefinitely, can be made by simply agitating the volatile oils with distilled water and filtering through a wetted filter-paper in the same manner that the Pharmacopœia suggests in the making of bitter almond and creosote water.

The technic for this method of making waters is very simple, and is as follows: Eight mils of volatile oil are poured into a four-litre bottle and distilled water added in portions, the bottle being vigorously shaken after the addition of each portion; sufficient distilled water is then added to make up to four litres.

When the dispensing bottle requires replenishing, the stock container is well shaken and the medicated water filtered through a filter-paper.

Since making our medicated waters in this manner we have never been troubled by the development of fungi or the growth of other microörganisms. This is certainly an advantage that the practical pharmacist can appreciate, as well as the fact that his medicated waters are always clear and sightly.

The saturation of these waters can easily be determined. If to an equal part of a water a 50 per cent. solution of magnesium sulphate is added there is at once developed a distinct cloudiness.

WHY APPLICANTS FAIL TO PASS THE STATE BOARD EXAMINATIONS.[1]

By George M. Beringer, Jr., P.D., Member Board of Pharmacy, State of New Jersey.

Why do men find it difficult to pass examinations of the State Board of Pharmacy? It seems that almost every one gives a different reason. However, let us see what kind of answers the candidates give in the examinations, and we shall then be in a better position to judge the real reason.[2]

The following answers were all given in examinations in Materia Medica before the New Jersey State Board of Pharmacy during the last year:

A Rubefacient "acts on worms."

Cannabis Indica "comes from Canada."

"*E-a-r-t-a-t-e-s* the nose" is the way one candidate describes the action of a drug.

Musk comes from the "Perpetual Follicles."

Musk "is a insect."

Musk "is Sumbul."

The official title of Alum is "Alumni."

Refrigerant was defined as "preventing from getting rancid." Example: "Benzoin would be a refrigerant in Benzoinated Lard."

"Citric Acid is mined."

"The *seed* of the plant is used in making Gossypium Purificatum."

"Supernal Glands" is the way one candidate writes Suprarenal Glands.

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[1] Read before the meeting of the New Jersey Pharmaceutical Association, Long Branch, N. J., June 22, 1916.

[2] That there is a condition that is very deep-seated and antedates that connected with the time that young men and young women come up for Board of Pharmacy examinations is shown by the following answers, collated by Wilson Rogers, Baltimore, which were given to a series of questions asked of students whose ages ranged from 14 to 18 years:

There were no Christians among the early Gauls; they were mostly lawyers.

Geometry teaches us how to bisect angels.

A blizzard is the inside of a hen.

A vacuum is a large, empty space where the Pope lives.

A circle is a round, straight line with a hole in the middle.

" Troches are intended as receptacles for medicine."

" The physical difference between Paraffin and Spermaceti is that Paraffin is purer."

The official title of Diphtheria Antitoxin is " Mamalia."

" A chemical heart tonic is stomach pump and emetic."

" Digestive ferments are those substances that give off gas in the stomach, as Castor Oil."

" Two classes of plant principles used in medicine are cotyledons and dicotyledons. Example: Bark—pith and wood."

" The chief constituent of Oil of Gaultheria is resin, starch, and sugar."

" An Anthelmintic is an agent that recovers from consciousness."

The following is the wonderful effort of one candidate:

" Gum Benzoin contains Myrosin. Becomes active when heated, then it can be used as a glue."

" Rhus Glabra grows in *South America* and *tropical countries.*"

" Hydrastis grows in *South America* and *tropical countries.*"

" Acacia grows in the *United States.*"

These last three were not given by one candidate only, but by many in the same examination.

" A Cholagogue is an agent used in cases of kidney disease to act as a filtering medium when the kidneys do not."

One candidate gives the correct definition, but gives as an example Resin Cerate.

" Diaphoretic, a drug capable of retarding *flem* from *bronical* tubes. Example: Matricaria."

The official name of nutmeg is *" Mysteria."*

Another says this drug is " odorless and tasteless."

" Honey—the official name is Mail—the source is bee combs."

" Honey—the official name is Ovis Orris, deposited by the bee."

" Honey is Mel Scrofula."

" The scientific name of the source of honey is *Glucose.*"

George Washington married Mary Curtis and in due time became the father of his country.

Sixty gallons make one hedgehog.

Georgia was founded by people who had been executed.

A mountain range is a large cook stove.

Achilles was dipped in the river Styx to make him normal.

Pompeii was destroyed by an eruption of saliva from the Vatican.

Typhoid fever is prevented by fascination.

EDITOR.

"Digitalis should be kept in tight sealed bottles because it picks up moisture from the air and it might deliquesce and become hardened."

"Digitalis should be made fresh often, as the older it gets the stronger it is."

"Cod Liver Oil is the oil taken from the bladder of the Cod-fish."

"Cod Liver Oil is obtained from the bladder of the fish."

"The official title of Cod Liver Oil is Oleum Origanum."

"Couch Grass has a *vacum* inside."

"Terebinthina Canadensis is a rhizome and root; the habitat is Europe."

"Spanish fly is *Diama.*"

"Infusion of Wild Cherry should be made with *hot* water so as to liberate all traces of *Carbon Dioxide* and to prevent the liberation of HCn."

Another candidate guesses, "It should be made with cold water to prevent from decolorizing."

"A Febrifuge destroys worms."

"A Febrifuge is a substance which chases away."

"An Antiparasitic checks up perspiration."

"An Antiparasitic prevents paralysis."

"An Antiparasitic is a drug that will reduce fever."

"An Antiparasitic is a drug relieving or preventing spasms of fits."

"The source of Cantharides is *Mosche Cantharidu.*"

"A vesicant is a mild cathartic, as Compound Licorice Powder."

"A vesicant is a drug that will serve as a vehicle."

"A vesicant is a drug that will enlarge a vessel to increase blood-pressure, as Strychnine."

"Tragacanth is Dandelion."

"Senna is a *folio.*"

"The source of Wax is *Abies* Melliferous."

"Wax is Cetaceum obtained from Spermaceti gotten from *the bone of the whale.*"

A wonderful display of knowledge on the part of one candidate follows:

"Amygdalin in the presence of Sulphuric Acid, Alcohol, and Ether produces an aldehyde, acetone, and HCN"; and he gave an equation, balanced on paper, to prove it.

Here is a candidate that surely does not need his own prescription.

In answer to a question concerning the proper base for an Ichthyol Ointment he answers: " I would recommend a 20 per cent. ointment for all ordinary purposes where reducing *information* is desired."

Where the candidate got the following is a mystery: " Two classes of plant principles are *Mamalia* and *Insecta*. A substance belonging to Mamalia is *Lard* from the *Sheep* and the *botanical* name is Ovis Aries."

" Acacia is used in Brown Mixture to keep the mixture in *suspense*."

Here is a candidate who has a vivid impression:

" Asafetida—odor like a skunk, taste awful."

Aqua Rosæ is obtained from the "*pedestil* of the Rose—chiefly."

Tinctura Ferri Chloridi—" taste very dry."

" Flour of Sulphur is *groung* roll sulphur," is about all one candidate knew about the description of sulphur.

Another says: " Sulphur has k-n-o-w odor."

Prunum—" dose 25 of them—good help for the bowels."

Another describes prunes as " a liquid, dark red in color."

Still another gives a description and ends with, " As one might see in an Acme Tea Store."

The question was: (*a*) " Define briefly each of the underscored words in the following definition:

" ' The *concrete* milky *exudation* obtained by *incising* the unripe *capsules* of Papaver Somniferum.'

(*b*) " Why is unripe specified? "

A few of the answers are represented in the following:

" Concrete is a substance of very binding nature."

" Concrete is the *foundation* of the capsule."

" Exudation is the juice obtained from it by extracting it."

The man who gave the following is evidently a *Bible* student who became confused:

" Exudate means to be taken out of bondage."

" A capsule is a dehiscent fruit that splits and permits the seeds to come out *unsolicited*."

" A capsule is a substance having a *vacum* which is capable of being filled by some other substance."

" Incising means exciting."

" Unripe is specified because it is of a *better nature* and yields more alkaloids."

" Cinchona is used as an *incipient* in pills."

"Two ferments of animal origin are Adeps Lanum and Adeps Lanum Hydrosus. Adeps Lanum is lard and is obtained from the fat of a hog."

"Uva Ursi is the bark of *Conden-drundum Tomentosi.*"

"Serum is Servum Antidiphtheritica obtained from the coagulated blood of a horse by separating the servum immerzed by the inoculation of Diphtheria Toxin."

"Rosa is a bulb with fleshy scales."

"Concrete saccharine exudation means the inside secretions of the *stomachic.*"

"Musk is obtained from the dried female insect."

"Moschus is Spanish flies."

"Tri-iodo-methane is Denatured Alcohol."

"Tri-iodo-methane is Sulphonethylethanum."

"The two varieties of Serpentaria official are Cinnamon and Sanguinaria."

"Bees belong to the family Ruminantia."

"Galla is from the *blatter* of Bos Taurus."

"Mel is the excreted juice of the beehive."

"Honey is Fel Bovis."

"Cantharides is found on *trees* of Cantharis vessicatoria."

"Cochineal is the *female part of the insect.*"

"Pistillate is when the *bark* of the plant contains pistils."

"Cera Alba is deposited by the *white bee.*"

"Aloes occurs in the form of a *limpid mass.*"

"Cerii Oxalas is from the intestinal juices of the ox (Bos Taurus) and the sheep (Ovis Aries)."

"Cerium Oxalate is a neutral principle from Goa Powder."

"Oxgall is a substance deposited in Quercus infectoria due to a puncture and ova of Cynips Tinctoria."

"Petrolatum makes it a softer *constituency.*"

"Oxgall is from the element Cerium by interaction."

"Fel Bovis is from the active principle of the cow or the ox."

"Acetphenetidinum is a white, *crystalline,* amorphous powder."

"Punica Granatum is Pumice Stone."

"A Compound of Chlorine and Calcium Hydroxide is Lime Water."

"Some drugs are easier to *commute* before they are dried."

"The chief contituent of Aloes is *trunk branches.*"

"Chloroform and Ether are both liquids having a choking sensation."

"Thymol Iodide has a *strong, viscid odor.*"

"Cocaine, in solution, is colorless with *toxicating taste.*"

"Aspidium contains *Cornutine,* Filicin, *Aspidospermine,* and Filicic Acid."

"Opium is obtained from Coco Beans."

"Opium is obtained from Papavia from incisions of *bark* and *trunk.*"

"The Poppy is spliced and Opium removed a mass."

"Opium comes from the *seed* of *Popa* heads."

"Rhamnus Purshiana should be kept one year to make sure that the *Amygdalin* is not reacted."

"The concrete milk juice of Lactuca Virosa is the milk of a cow."

"The prepared milk juice of several species of Hevea is *Saccharum Lactis.*"

The following covered a full sheet of legal-cap paper and was given by the candidate in answer to a question as to the proper base to be recommended to a physician for use in Ichthyol Ointment under certain conditions:

"The physician should know these things himself and he should not ask the Pharmacist. He went to college and he ought to know. But, however, I would advise him to use for a base Lanoline Hydrosis and Petrolatum, because Lanoline Hydrosis contains water and that would be the maximum absorption according to my experience, being in the drug business for over 11 years and I have compounded some prescriptions and some Preparations.

"M——— D——— (Name of candidate). Not a registered Pharmacist in any state, but I hope to God I get registered in New Jersey as I am a married man with 2 children.

"This is the 2nd time I am taking the J. B. and I studied very hard."

No doubt the ludicrous side of these will appeal to you first. But, as the seriousness of it presents itself, you will find it hard to believe the answers *bona fide.*

Very many of those taking the examinations are graduates of a college of pharmacy or have had some college training. Yet, nearly seventy per cent. of the candidates fail, despite the fact that the examiners endeavor to make their examinations fair and of a practical character. The more I look into the matter, the more I am convinced that the system and the character of the instruction given in the college are largely to blame for these failures. Most of the answers show a tendency to memorize a miscellaneous collection of more or less unrelated facts. Candidates come to examiners time after time, saying they have taken this or that course calculated to enable them to pass the State examinations, and want to know what text-book they shall study to be able to pass.

College professors seem content with "parrot" teaching and "parrot" learning from the text-books. Why is this so? Usually, the professors are selected, not with a view of their ability to teach, but because they are more or less successful in some work related to pharmacy or because they are willing to do the work cheaply for the sake of the prestige pertaining thereto.

How many teachers in our colleges of pharmacy have studied even the rudiments of psychology, or possess even the rough psychology that enables many men to rightly judge the mental processes of their associates? How many of these teachers have had any training or even done reading in pedagogics? I doubt if one or two in a hundred could answer "yes."

The result is that the average teacher loses sight of the fact that the students under him are only children of a larger growth, mentally as well as physically; that in them, to a certain extent, there still exists the natural inquisitiveness of the child which makes him acquire knowledge so readily when guided in the proper manner.

The student of to-day has, in his early school training, a much better and broader foundation upon which to build his later technical training than had his predecessors. It is the duty of the technical instructor to establish points of contact with this earlier knowledge, and upon it, with the aid of the student's natural inclinations, build a solid structure of knowledge, or, rather, assist the *student* to build such a structure.

He cannot do this by "cramming" *dead* facts into his students. He must, rather, stimulate them by such a *live* presentation of his subject that the student will acquire the facts for himself in the manner best suited to his individual mentality.

If this is done we shall have candidates who can *reason* answers for themselves, and can explain their text-book definitions when they use them. In other words, their knowledge will have become part of them, to be used as a means for further advancement—to what heights, who can tell?

VITAMINES AND NUTRITIONAL DISEASES.[1]

A Stable Form of Vitamine, Efficient in the Prevention and Cure of Certain Nutritional Deficiency Diseases.

By Atherton Seidell, Hygienic Laboratory.

According to the recently developed conceptions of nutritional deficiency diseases, particularly beriberi and pellagra, a factor, hitherto unrecognized, must be taken into consideration in respect to the essential food elements necessary for normal metabolism. This constituent has been given the name " vitamine," and this term now expresses the idea that in addition to the usual proteins, fats, carbohydrates, etc., contained in ordinary foodstuffs there must be present also a sufficient amount of vitamine in order that normal metabolism be maintained.

It is recognized that although vitamines undoubtedly are widely distributed in food products, they occur for the most part in very minute amounts, and the various foods differ in the proportions which they contain. In the case of an ordinary mixed diet a supply of vitamines ample for the needs of the organism will no doubt usually be present. On the other hand, if the diet is made up principally of foods poor in vitamines or rendered so by their preparation, it would be expected that an insufficient amount of these substances would be provided and that abnormal metabolic processes would result. The studies which have been made on beriberi, and especially on polyneuritis in fowls, have definitely established this conception of the rôle of vitamines in metabolism.

In all attempts which have so far been made to isolate vitamines in sufficient quantities for experimental studies, only very small yields have been obtained. This has been due to the apparent destruction of the physiologically active substance during the various steps of the several processes employed. On this account it has so far not been possible to make convincing demonstrations of the specific function of isolated vitamines in nutritional deficiency diseases of human beings. It was in the hope of developing an efficient procedure for obtaining a relatively concentrated and comparatively cheap form of vitamine, suitable for studies on the prevention and cure of such human nutritional deficiency diseases as beriberi, pellagra, infantile malnutrition, etc., that the following briefly-described experiments were undertaken:

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[1] Reprinted from the *Public Health Reports,* vol. 31, No. 7, Feb. 18, 1916, pp. 364-370.

Of the various substances which have been shown to be rich in vitamines, brewer's yeast is probably, at present, the cheapest. In all save perhaps a few of the larger brewing establishments the bottom yeast remaining after each brew is washed down the sewer. This material, therefore, appeared to meet every requirement for cheapness. As obtained from the brewery[2] it is in the form of a light-colored mush. It is first subjected to pressure in a hydraulic press for removal of the beer still retained by it. The press cake is then stirred with ice water and again pressed out. The cake is placed in enamel-ware vessels and brought to a temperature of 37.5° C. and held there for a period of about 48 hours. The autolysis is more or less complete at the end of this time and the material converted to the consistency of thick soup. After cooling to room temperature, the liquid is filtered through large folded filter papers. All methods of filtration involving the use of pressure which were tried, failed. The weight of clear red brown filtrate amounts to approximately 50 per cent. of the weight of the unfiltered material.

This filtered autolyzed yeast contains about 23 per cent. of total solids, determined by evaporation in a vacuum desiccator. It will keep in a cool place, without noticeable change, for several months, possibly much longer. If administered in 1 Cc. doses on alternate days to a pigeon kept on an exclusive diet of polished rice, the pigeon does not lose weight nor show symptoms within at least two months, the period during which the present experiment has been under way. A pigeon kept on polished rice without the yeast filtrate begins to lose weight usually within the first five days and dies with the typical paralysis of polyneuritis within about 20 days. If 1 Cc. of the yeast filtrate is given to completely paralyzed pigeons a relief of the paralysis will occur within an hour and to all outward appearances the pigeon will be restored to a normal condition within 12 hours.

Although this yeast filtrate is evidently very active and has good keeping qualities, an effective dose for a man, as estimated from the amount required for pigeons, would be about 200 Cc. It was therefore realized that the material would have to be considerably concentrated before it could be successfully used in human cases.

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[2] Acknowledgments are due the Christian Heurich Brewing Company, of Washington, for the very liberal supplies of yeast used in the present investigation.

The procedures originally employed for concentrating the yeast filtrate included vacuum distillation, evaporation in a current of dry air, and freezing and removing the ice by centrifugation according to the method perfected by Mr. H. C. Gore, of the Bureau of Chemistry, for concentrating cider and fruit juices. Although a portion of the dissolved solids separated during the concentration and could be removed, the resulting concentrated liquid became more and more syrupy and it was impossible to convert the material to a solid condition. The use of alcohol for precipitating the inactive material from the very concentrated solution was at first thought to be a practical step, since an easily removed granular product was obtained. On concentrating the alcoholic filtrate from this product and estimating its activity by experiments on neuritic pigeons it was found that a considerable loss of the active constituent had occurred. An examination of the solid precipitated by the alcohol showed it to be quite active; hence a distribution of the vitamine had taken place. It was therefore apparent that the use of alcohol for concentrating the vitamine in yeast filtrate was not a practical procedure from an economic standpoint.

After experiments with a number of other procedures had failed to yield satisfactory results, attention was turned to the possibility of using a medium which might exert a selective adsorption for the vitamine. It was shown several years ago by Prof. John Uri Lloyd, of Cincinnati, that certain varieties of fuller's earths could, by proper treatment, be rendered very efficient in the selective adsorption of alkaloids from complex mixtures. It was thought that possibly this material might remove the vitamine from the autolyzed yeast filtrate. Preliminary experiments indicated that such a removal of it could be effected. After beginning the work, there was found a published statement by Chamberlain and Vedder [3] to the effect that the neuritis-preventing substance of extracts of rice polishings is removed by filtering through bone black. This observation strengthened the expectation that a separation of the vitamine from the substances accompanying it in filtered autolyzed yeast could be effected by means of an efficient adsorptive agent.

Through the kindness of Professor Lloyd a large quantity of the especially selected and prepared hydrous aluminum silicate which he uses for alkaloidal separations, and which is known as "Lloyd's Reagent," was sent to the writer. It was decided that in the first experiment a relatively large amount of the adsorptive agent should be used. Two hundred grammes per litre of yeast filtrate were therefore selected, and the mixture was thoroughly shaken during about 15 minutes and then filtered through a large Buchner funnel. The filtrate was reserved and the residue pressed out with a spatula and, without washing, drained with air suction as thoroughly as possible. The solid residue was transferred to a vacuum desiccator containing concentrated H_2SO_4 and dried to constant weight.

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[3] Philipp, *J. Sci.* (B), 6, 399, 1911.

As indicated in connection with the description of the autolyzed yeast filtrate, there are two methods of determining the activity of a product in respect to polyneuritis—first by the prevention of the onset of the symptoms and second by means of curative experiments. Both methods were employed in the case of the solid, which had been shaken with the autolyzed yeast filtrate, and of the clear liquid recovered after treatment with the solid.

In the case of the curative experiments it was found that a pigeon suffering from severe paralysis, due to an exclusive diet of polished rice, showed unmistakable improvement within an hour after a dose of the solid corresponding to 3 Cc. of the yeast filtrate, and to all outward appearances was normal the next morning. Similar experiments made with the filtrate from the solid showed it to have no appreciable curative action.

The feeding experiments were conducted on a group of 12 pigeons. They were kept in a large cage and given as much polished rice as they would eat. They were weighed and dosed as follows at intervals of two to three days: Two of the pigeons were given 3 Cc. doses of the original yeast filtrate (Y. F.), three received doses of 0.6 gramme of the activated solid (A. S.) corresponding to 3 Cc. of Y. F., three received 3 Cc. doses of the filtrate from the activated solid (F. A. S.), and four were retained as controls.

The results are plotted on a chart accompanying the original paper. It is shown that the pigeons receiving the autolyzed yeast filtrate and the solid activated by being shaken with the yeast filtrate not only showed no ill effects from the exclusive diet of polished rice but actually gained considerably in weight. The controls and those receiving the filtrate from the activated solid all developed the typical paralysis of polyneuritis within from 11 to 23 days. The experiment, therefore, proves conclusively that, using a ratio of 200 grammes per litre, the adsorptive agent removes the vitamine promptly and completely from autolyzed yeast filtrate.

Attention was next turned to ascertaining how small a proportion of the solid reagent would adsorb the vitamine completely from the yeast liquor. This information was considered desirable in order that an activated solid containing as high a concentration of the vitamine as possible might be obtained; one in which doses sufficient for human patients would be contained in amounts of the solid small enough for convenient administration.

An experiment made with the solid and with the filtrate obtained by separating a mixture of only 20 grammes of the reagent to 1 litre of yeast liquor showed that, although the solid was active when given in doses corresponding to 3 Cc. of the original yeast liquor, the liquid filtered from the solid still retained a sufficient amount of vitamine to protect pigeons for periods of over two months when given in 3 Cc. doses on alternate days. From this it is evident that only an incomplete separation had been effected.

The proportion of 40 grammes of solid per litre was next used but the filtrate was found still to be just slightly active. When 50 gammes per litre were used only an inconsiderable amount of vitamine appeared to remain in the yeast filtrate. This, therefore, was considered to be the lowest proportion of solid reagent which could be employed for removing the active material from autolyzed yeast filtrate. A curative experiment made with the filtrate obtained in using 50 grammes solid per litre resulted as follows: A pigeon which was beginning to show weakness indicative of the approach of the paralysis of polyneuritis was given 5 Cc. of the filtrate and the next day showed a very slight improvement. The 5 Cc. doses of the filtrate were continued on alternate days, but the symptoms of polyneuritis developed progressively until typical paralysis, followed by death, resulted on the eighth day succeeding that of the first dose. There was evidently just enough active material in the relatively larger doses of filtrate to delay the fatal termination about one week.

On the basis of the above-described experiments the procedure which has been adopted for preparing activated solid from autolyzed yeast liquor is as follows: To a large volume of clear autolyzed yeast filtrate is added 50 grammes per litre of the colloidal hydrous aluminium silicate reagent as prepared by Professor Lloyd, of Cincinnati, for alkaloidal separations. The mixture is well shaken and allowed to stand several hours until the supernatant liquid is practically free of suspended solid. The dark liquid is then siphoned off and about an equal volume of water and enough standard hydrochloric acid is added to yield an approximately N/100 acid solution. The addition of this small amount of acid is necessary to hasten subsidence of the solid. After shaking and allowing to stand, the supernatant liquid is again siphoned off. The solid is washed a second time with the very dilute acid and then poured upon a large Buchner funnel and washed several times with small portions of water and finally with about three small portions of 95 per cent. alcohol. The solid is then spread out on paper to permit the evaporation of the major part of the alcohol and finally dried to constant weight in vacuum desiccators containing concentrated sulphuric acid.

Both preventive and curative experiments on pigeons have been made with this material, and the results agree with those already described, it should be mentioned that much evidence has been ratio of 200 grammes of reagent per litre of yeast filtrate. It has been found that prompt and effective cures of completely paralyzed pigeons result from 0.05 gramme doses of the activated solid, corresponding to 1 Cc. of the original yeast filtrate. Preventive experiments, continued at present for over a month, using 0.05 gramme of the solid on alternate days, show that the pigeon retains its normal health and weight on an exclusive diet of polished rice.

On the basis of 60 kilogrammes as the weight of a man, as compared with 300 grammes for the pigeon, a comparable dose of the activated material would be 10 grammes of the solid on alternate days, or 5 grammes per day. This is a quantity which could be conveniently taken either in capsules or as an aqueous suspension. The material is practically tasteless and odorless, and aside from the vitamine which it contains is an absolutely inert substance which would produce no noticeable effects on passage through the body.

In regard to the probable therapeutic value of the product here described, it should be mentioned that much evidence has been advanced to show that polyneuritis in birds is essentially the same disease as beriberi in man, consequently, it may be expected that the concentrated vitamine may prove to be an efficient remedy for beriberi. That it will be valuable in the treatment of pellagra can not be asserted until clinical tests on human cases have been made; it can only be said that if the source of the vitamine at present selected—*viz.*, yeast—should happen not to be well chosen as regards pellagra, the method here described for concentrating the yeast vitamine probably could be applied equally effectively to some other raw product.

In conclusion it should be mentioned that the procedure here developed for yeast can be used with slight modifications in the estimation of the vitamine content of various food products. Experiments already under way upon the potato have demonstrated the applicability of the method.

QUARTERLY REVIEW ON THE ADVANCES IN MATERIA MEDICA AND PHARMACY.

By John K. Thum, Ph.G., Pharmacist at the German Hospital, Philadelphia.

The various state pharmaceutical associations throughout the country have practically all held their usual yearly meetings, and, while nothing of a startling nature was accomplished by any of them, yet, taken on the whole, pharmacy or, rather, the pharmacists of the country seem to be aware of the needs of the profession and are earnestly striving to fill those needs.

At the meeting of the Pennsylvania State Pharmaceutical Association, perhaps the most important need of the profession—and all present seemed to view it that way—is the necessity for a new state narcotic law; one that would reënforce and overcome the shortcomings of the national law. The Committee on Legislation presented a report, embodying what they considered the essential features, which was adopted by the association. Recognition was also given to the fact that one of the prime needs of the profession was a revision of our patent laws, and some safeguarding from the effects of foreign monopolies. To this end a resolution was introduced "asking for a change in the United States patent laws so as to discontinue the patenting of products, but recognizing only applications for patents on processes."

One of the really admirable and extremely valuable features of this state association is its possession of a "Publicity Committee." The work of this committee during the trying times of the last two years, in connection with the fluctuations in prices to the public of medicines, and its successful reaching of the public with information as to the legitimate causes of higher prices, through the medium of the newspapers and magazines, was enthusiastically commented upon and gratefully appreciated by the association. The report of this committee is worth reading. The appointment of such a committee by all state associations, and particularly the American Pharmaceutical Association, could be used as a good argument for the acquisition of new members. It surely is worth while for the pharmacist to know that whenever any questions arise between him and the public, his state and national associations have the proper function for affording him some measure of protection through the medium of the public press.

Among other things that the Committee on Legislation recommended in its report was that a bill be introduced in the next meeting of the Assembly amending the pharmacy law so that experience gained in a hospital pharmacy be credited; that is to say, that an applicant for registration in the State of Pennsylvania need have only two years' retail experience, provided he or she presents satisfactory evidence that he or she has had two years' experience in a hospital pharmacy conductd by a registered pharmacist. This is a step in the right direction. We hope to see the time when a graduate in pharmacy can be registered solely on work done in a hospital pharmacy laboratory or other manufacturing pharmaceutical laboratory. The opportunities for real pharmaceutical training and development in a hospital pharmacy are greater by far than in the average drug store. Men and women who have this training, who really never had the opportunity for a retail experience, and have never desired it, and yet must be, and desire to be, legally recognized as pharmacists, certainly are as well, if not better, qualified to safeguard the public as one having solely drug experience as acquired in the average retail store.

The suit for libel against the American Medical Association by the Chattanooga Medicine Company resulted in a technical victory for the latter. It will be recalled that the nostrum concern claimed that the charges made by the medical association, as appearing in its official publication, stating that the business of the company was built on deceit and its preparation a vicious fraud, were untrue and libelious; it therefore sued for damages to the extent of $300,000. The jury, after deliberating for a week, brought in a verdict for the medicine company and placed the damages at one cent. As the *Journal of the A.M.A.* puts it, "Technically guilty; morally justified."

It is of interest to know that the Supreme Court of the United States has decided that an advertiser is guilty of fraud if he misrepresents his goods and through such misrepresentation inveigles any one to buy or invest. This decision, it seems to us, is going to have a far-reaching effect on all kinds of business concerns and ventures that depend largely upon advertising for reaching the public. It also means that there will necessarily be considerable revision of the literature indulged in by "patent-medicine" concerns. That there is a real need for reform along the lines of truth and common ordinary honesty in business in general must be admitted by all who have any vision and foresight whatever. Indeed, the action of the Supreme Court is in itself sufficient recognition of just such a need.

The periodic discussion as to the desirability and value of a more general use of the metric system in this country has again made its appearance. There really is no argument among thinking people as to the desirability of its more general use or, for that matter, its sole use; especialy the advantage to those of our merchants who are after foreign trade, for be it known that the people from other countries, and especially those south of us, are familiar with only one system of weights and measures, and that is the metric system. Next to our lack of banking facilities in South America, our non-use of the metric system is deemed by many observers as one of the main reasons why our trade with that section of the world does not begin to compare with that of the other countries of the world; and when one considers our close proximity to that fertile field for the development of commercial relations and trade, and the advantage such proximity gives us, it is really very surprising that our business men have not bestirred themselves before this. The introduction of the following bill augurs well for a more general use of this system of weights and measures, and the business men of the country should give it their earnest support.

"A Bill to adopt the weights and measures of the metric system as a standard weights and measures in the United States.

"*Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,* That on and after the first day of January, 1918, all the departments of the government of the United States in the transaction of all business requiring the use of weight and measurement, except in completing the survey of public lands, shall employ and use only the weights and measures of the metric system; and on and after the first day of January, 1920, the weights and measures of the metric system shall be the legal standard weights and measures of and in the United States."

Thymol still continues to remain at a top-notch price, and yet this should not be, as this country possesses the means of what should be the main source of thymol production in this section of the world.

It will no doubt be remembered that the main source of thymol manufacture for many years has been the oil from ajowan seed. The fact that this plant is indigenous and cultivated in India, and also in the countries just west, as well as in Egypt, accounts for the scarcity of thymol, with its consequent high price. The disordered state of the shipping transportation facilities due to the European war is accountable for the scarcity and elevated prices of many things that civilization has hitherto been used to. This is, in large measure, undoubtedly the main reason for the scarcity of thymol in this country. It has been known for some time—in fact, the literature on the subject of thymol mentions it—that the wild horsemint, which grows so plentifully in certain sections of this country, could be utilized very readily as the source of thymol, as the volatile oil from this plant contains at least 60 per cent. of thymol. It has just been pointed out by the United States Department of Agriculture that the commercial production of thymol in this country is possible, and it mentions the fact that horsemint would yield it in sufficient quantity to make its manufacture a profitable venture. As a result of the department's investigations, which, by the way, have been published in Bulletin 372, it feels justified in stating that it will thrive under cultivation wherever it may be found growing wild; it also believes that a plantation of this plant would not have to be replanted oftener than once in five years, and possibly under good conditions may continue to give a good yield for a longer period of time. This bulletin contains considerable information and should be of great practical value to those who may find their way clear to developing the possibilities of the thymol industry in this country.

Sodium Hydroxide to Destroy Anthrax Spores on Skins and Hides.—A one-half to one per cent. solution of sodium hydroxide destroys the spores of *Bacillus anthrax* at a temperature of from 15° to 20° C. It has been discovered that when infected hides or skins have been immersed for a period of 72 hours in such a solution, all the anthrax spores are killed. It was also noticed that the germicidal action of the solution was greatly increased if from 5 to 10 per cent. of sodium chloride was dissolved in the solution. It has also been found that treatment of the spores with sodium hydroxide before pickling has the advantage that soaking, liming, and disinfecting may be done in one process. It is also necessary that the weight of the dilute caustic alkali used be at least ten times the weight of the hides and skins under treatment. (*Chem. Abstr.*, 1916, 10, 985.)

Acidity of Normal Pancreatic Secretion.—The authors have done additional work, which confirms their original statements as to the acidity of the pancreas. They worked with pancreatic glands of sheep, hogs, and oxen, and many other animals. In all cases they found the secretion of the pancreatic glands decidedly acid. Variations due to season were not apparent; the acidity remains the same at all seasons of the year. They also worked over other organs of various animals to determine the reaction of the secretions from the parotid gland, the liver, and the spleen, and found them all to be acid, but not so much so as the secretion from the pancreas. The bile was slightly alkaline or neutral, and the thyroid neutral. They found the pancreatic secretion very rich in phosphates; sulphates and traces of chlorides were also found. Potassium seemed to be the most abundant metal present. They state that the acidity, which is greater than that of any other organ, is due to acid phosphates and acid nucleoproteins, alkali salts of which are also present. (*J. Amer. Chem. Soc.*, 1916, 38, 1115, by J. H. Long and F. Fenger.)

Estimation of Alkaloids by the Hydrochloride Method.—The alkaloid is extracted with the aid of ether; the ethereal solution is then subjected to the action of dry hydrochloric acid gas, which precipitates the alkaloid as hydrochloride; evaporation of the ether is then carried out with subsequent weighing of the salt. The salt is then dissolved in water and titration of hydrochloric acid with standard alkali performed, using phenolphthalein as the indicator. It is claimed that by this method very good results have been obtained in the estimation of conium seeds; in this case the alkaloid was estimated as coniine monohydrochloride; like results were obtained in estimating tobacco and colchicum root. It is interesting to know that in all these cases the hydrochloride of the alkaloid separated, in part, as a crystalline solid and as an oil, when the ethereal solution, without color and free from fat, was treated with gaseous hydrochloric acid. What this oil is, is not yet definitely known, but it might possibly be a higher monohydrochloride. When the oil is washed with cold ether until free from free hydrochloric acid it still fumes in moist air; placed in a vacuum desiccator with some solid potassium hydroxide, it is changed into the monohydrochloride. (*Jour. Ind. and Eng. Chem.*, 1916, 8, 48, through *The Analyst*, May, 1916.)

Fat of Nux Vomica.—It has been estimated that nux vomica seed contains from one to two per cent. of solid fat, and that this consists mainly of glycerides of capric, caprylic, caproic, butyric, and palmitic acids. A specimen of this fat showed a dark-brown color, had a rather unpleasant smell, and gave these values: Sp. gr. at 100°/15.5° C., 0.892; solidification-point, 60° C.; acid value, 33.7; saponification value, 152; Reichert-Wollney value, 1.0; iodine value (Hubl), 54, and acetyl value, 31.2. (*Jour. Soc. Chem. Ind.*, 1916, 35, 201, through *The Analyst,* May, 1916.)

Etiology of Common Colds.—It is stated that there exists experimental evidence which seems to prove that the infection of what are popularly known as common colds, of a certain type, are due to a virus developing in the nasal secretions, and which is also able to pass through a Berkefeld filter impervious to ordinary bacteria. Transference of the infection from one person to another probably happens from droplet infection, or by means of direct or indirect contact. Culture experiments seem to show that a virus from the nasal secretions of persons ill with an acute cold will develop, on cultivation, subcultures which, after passing through the Berkefeld filter, reproduce colds experimentally. While it cannot be definitely stated that a specific organism has as yet been isolated, the results seem to show that such organisms exist. (*Jour. Amer. Med. Assoc.*, p. 1180, 1916, by G. Foster, M.D.)

Russian Aconite.—*Aconitum orientale* grows wild in profusion in the Crimea and in Bessarabia. It is characterized by having a rather small, compact, grayish-black root with a transverse section similar to that of *Aconitum Napellus.* Its taste is said to be hot and acrid. When treated by a process which gave 0.0526 per cent. of crystalline aconitine from a sample of powdered root of *Aconitum Napellus,* the dried root of *Aconitum orientale* yielded 2.207 per cent. of total alkaloids, although in an amorphous condition. This awaits further investigation. (*Jour. Pharm. Chim.*, 1916, 13, 329.)

Chemical Standardization of Aconite Tincture Useless.—The alkaloidal standardization of tincture of aconite by the method advised in the Pharmacopœia, which consists of determining the ether-soluble alkaloid, which, in turn, is titrated as aconitine, is considered by this investigator as not only useless but also sufficiently misleading as to be more or less dangerous. He states that the only reliable method of standardizing the activity of any of the aconite preparations is by a uniform biological method. He found that the lethal dose for a guinea-pig is really the most convenient and satisfactory method for arriving at a standard. He worked with four different tinctures, each having an aconitine content of 0.04298, 0.04183, 0.04183, and 0.04093 grammes in 100 mils; these were very near to the pharmacopœial requirement, which is 0.045 gramme in 100 mils. Yet upon biological examination they all showed a tremendous difference in activity. Placing the lethal dose of the first as 1, that of the others was respectively, 1.97, 1.97, and 7.27. It can be readily seen that the first tincture was easily more than seven times as strong as the last. No evidence was obtainable which might have explained the difference as due to deterioration of the tinctures. Each preparation was made on the same date. (*American Druggist*, 64, 129, 1916, by C. C. Haskell.)

CIGNOLIN, A NEW CHRYSAROBIN SUBSTITUTE.—1-8-dioxyanthranol, blessed with the fanciful name of "Cignolin," is handed to the medical profession as a wonerful substitute for our old friend "chrysarobin" in the treatment of skin diseases. It is described as a yellow powder, easily soluble in fats, alcohol, acetone, and benzene. Petrolatum alba is supposed to be a most satisfactory base for its application in ointment form. When exhibiting it in this manner it should be first rubbed smooth with a few drops of some bland oil. (*Dermatolog. Woch.*, 1916, 133.)

ANTIMONY FROM ALASKA.—Large quantities of stibnite ores are being worked in the Fairbanks district and the Seward Peninsula, in Alaska, the high prices being offered for antimony undoubtedly being the cause of such unusual activity in these mining regions. The total shipment of ores containing antimony from Alaska during 1915 was valued at over $170,000. This ore contained at least 50 per cent. of antimony. The great demand for this metal has increased prospecting for the ore. Stibnite is by no means uncommon in this region of the world, and the new industry will no doubt show considerable development. (*Mining Jour., Jour. Ind. Eng. Chem.*, 1916, 8, 376.)

STRAMONIUM LEAVES FROM SOUTH AFRICA AND THE SUDAN.—A specimen of *Datura Stramonium* leaves from South Africa has been examined at the Imperial Institute and found to contain 0.54 per cent. of total alkaloids, calculated on the dry material, which is in excess of the amount usually present in the European drug. The chief alkaloid present was hyoscyamine. A sample of the same drug from the Sudan in the form of mixed stems, leaves, and capsules gave only 0.13 per cent. of total alkaloids. Another sample of seeds from the latter place gave only 0.096 per cent. of total alkaloids, whereas the yield from European seeds is from 0.21 to 0.48 per cent. In view of the higher yield of hyoscyamine obtainable from Egyptian *Hyoscyamus muticus,* it is not likely that South African stramonium would prove a remunerative source of hyoscyamine or of atropine. However, if the leaves were shipped to this country in a well-dried condition, of good color and of the present alkaloidal value, they could readily be used for other purposes. (*Bull. Imp. Inst.,* 1916, 14, 21.)

SOLUBILITY OF NAPHTHALENE IN AMMONIA.—Naphthalene is soluble in solution of ammonia of 5 per cent. strength in NH_3 to the extent of 0.030 Gm. per 1000 Gms. of liquid; in 10 per cent. solution of ammonia, 0.042 Gm. per 1000 Gms.; in 25 per cent., 0.064; in 100 per cent., 33.0 per 1000 Gms. These figures are obtained at 0° C. At 25° C. they respectively are: 0.044, 0.074, 0.162, and 120.0 Gms. in 1000 Gms. If the solution of ammonia contains 2 per cent. of pyridine, the solubility of the naphthalene is increased by 0.082 Gm. at 0° C., and by 0.245 Gm. at 25° C. Phenol does not influence the solubility. A stream of carbon dioxide passed into 25 per cent. solution of ammonia containing dissolved naphthalene causes the greater part of the latter to be thrown out of solution. The distillation of solution of ammonia containing naphthalene in solution results in blocking of the condenser tubes unless these are kept at a temperature not lower than 30° C. (*Zeitsch. angew. Chem.,* 29, 1916, by S. Hilpert.)

ESTIMATION OF NAPHTHALENE IN AMMONIA.—A definite quantity of the solution is cooled in water (iced), neutralized by the gradual addition of sulphuric acid, the cooling being maintained during the process. The liquid is then distilled and 30 mils of distillate collected. This is then extracted with ether, and the condenser rinsed out with the liquid; at this point the mixed ethereal solutions are treated with excess of N/20 solution of picric acid. At the end of two minutes the ether is evaporated under pressure, the residual aqueous solution is cooled in ice-water, the precipitate collected on a filter, washed with 5 mils of ice-water, and titrated with N/10 solution of sodium hydroxide, using litmus as an indicator. (*Zeitsch. angew. Chem.,* 29, 1916, by S. Hilpert.)

ALCOHOL FOR RETARDING THE SETTING OF PLASTER OF PARIS.—It has been shown that the addition of alcohol in varying proportions to the water employed for slaking the plaster has a very marked effect in retarding the time of setting and in lessening the degree of heat involved in the reaction. This effect is directly proportional to the quantity of alcohol used. In round numbers, the addition of 10 per cent. of alcohol doubles the period of time required for the setting of plaster of Paris for surgical purposes. For instance, 10 grammes of plaster of Paris slaked with 60 mils of water took fourteen minutes to set; with the addition of 10 per cent. of alcohol, thirty minutes were required, and with 25 per cent., an hour. Since alcohol is always at hand in the pharmacy, it is more convenient to use than such articles as powdered marshmallow, acacia, tragacanth, or flaxseed mucilage. This plan of using varying proportions of water and alcohol enables the surgeon to have a plaster-of-Paris cast set at any desired time. (*The Pharm. Jour. and Pharmacist,* May 6, 1916.)

IDIOSYNCRASY TO ACETYLSALICYLIC ACID.—This physician speaks of three cases from his own practice and mentions seventeen cases that he found in literature in which the administration of acetylsalicylic acid was followed by œdema. The doses ranged all the way from 0.3 to 1 gramme, and the pathological reaction occurred always after the first dose, notwithstanding the amount taken. The author thinks some instability of the vasomotor system appears to be responsible for the trouble, while in certain cases some favoring factors were probably application of local heat, fear of poisoning, a preëxisting infection, or other coöperating cause. (A. Klercker, *Hygeia,* Stockholm, through *Jour. Amer. Med. Assoc.,* April 15, 1916, p. 1282.)

PHARMACOLOGIC AND CLINICAL STUDY OF PAPAVERIN.—According to the investigator, this alkaloid was found to have some very interesting pharmacological properties. The most prominent among these are its effect on the heart and blood-pressure, its action on the coronary circulation, its stimulating effect on the respiration, its relaxing and tonus-lowering influence on the smooth muscle structures, and its remarkable analgesic power. These, together with its comparatively low toxicity, prompted its employment for therapeutic purposes. All the clinical experiences described favor its use, and the author hopes that further observation be carried out to determine its exact therapeutic value in medicine. (*Archives of Internal Medicine,* Chicago, June, Part I, xvii, No. 6, 1916, by D. I. Macht, Baltimore.)

EMETINE SALTS AND PYORRHŒA ALVEOLARIS.—The amœbicidal action of emetine hydrochloride is admitted by this author, yet he is unable to confirm the various statements appearing from time to time that this salt is an absolute remedy for Pyorrhœa alveolaris. In his experience he found that the alkaloidal salt by itself will not cure this disease. Out of a series of 78 cases, all showing endamœbæ, none lost their endamœbæ permanently. The gums and teeth in three cases were greatly improved, but only moderately so in nine cases; only slight improvement was noticed in 23; 40 cases remained the same; in two cases the results were doubtful, and in one the patient became worse. All that were without endamœbæ at the end of the treatment soon became positive again in various periods, ranging from two weeks to four months, and in spite of the continuous use of a solution of ipecac as a mouth-wash. (J. S. Ruoff, AMER. JOUR. PHARM., 1916, p. 164.)

SOME FALLACIES REGARDING PHENOL.[1]

A REVIEW WITH REPORTS OF OBSERVATIONS ON THE INFLUENCE OF ETHYL ALCOHOL ON THE GERMICIDAL AND ON THE TOXIC PROPERTIES OF PHENOL.

By MARTIN I. WILBERT, Technical Assistant, Hygienic Laboratory, United States Public Health Service.

(*Concluded from August issue.*)

In the appended tables, which are continued from p. 371, an effort has been made to include only the essential information recorded in the protocols. The dose per mouse and dose per gramme of mouse represent the weight of phenol in the solutions used.

TABLE A.

One Per Cent. Phenol in Water.

Mouse No.	Weight	Approximate amount of 1 per cent. solution of phenol per mouse	Phenol per gramme weight of mouse	Result	Time	
	Grammes				*H.*	*m.*
298	16.4	0.427	0.00026	Survived	..	..
299	19.65	.512	.00026	Survived	..	..
300	18.5	.582	.00032	Survived	..	..
301	19.85	.632	.00032	Survived	..	..
302	18.75	.712	.00038	Died		..
303	20	.761	.00038	Survived	..	3
304	19	.875	.00046	Died	1	0
305	20.4	.958	.00046	Died	20	04

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[1] Reprint from the *Public Health Reports*, vol. 31, No. 17, April 28, 1916, pp. 1046–1054.

TABLE B.

One Per Cent. Phenol in Distilled Water (Containing 3 C. C. of 95 Per Cent. Alcohol Per 100 C. C. Solution).

Mouse No.	Weight	Approximate amount of 1 per cent. solution of phenol per mouse	Phenol per gramme weight of mouse	Result	Time	
	Grammes				*H.*	*m.*
306	16.75	0.437	0.00026	Survived	..	..
307	19.7	.513	.00026	Survived	..	..
308	18.5	.582	.00032	Survived	..	..
309	19.9	.637	.00032	Survived	..	..
310	18.9	.719	.00038	Survived	..	..
311	20.1	.765	.00038	Died	3	45
312	19.05	.877	.00046	Died	1	30
313	21	.966	.00046	Died		45

TABLE C.

One Per Cent. Phenol in Distilled Water (Containing 9 C. C. of 95 Per Cent. Alcohol Per 100 C. C. Solution).

Mouse No.	Weight	Approximate amount of 1 per cent. solution of phenol per mouse	Phenol per gramme weight of mouse	Result	Time	
	Grammes				*H.*	*m.*
370	16.60	0.432	0.00026	Survived	..	..
371	20.95	.545	.00026	Survived	..	..
372	18.25	.583	.00032	Died	..	35
373	21.65	.693	.00032	Died	10	20
374	19.95	.758	.00038	Died	10	15
375	23.35	.887	.00038	Survived	..	..
376	20.75	.955	.00046	Died	3	30
377	25.60	1.176	.00046	Died	5	0

CURRENT LITERATURE.

FRAUDULENT INFANTILE PARALYSIS "CURES."

Officials of the Department of Agriculture charged with the enforcement of the Food and Drugs Act expect that the outbreak of infantile paralysis will tempt unscrupulous persons to offer for sale so-called "cures" or remedies for this dread malady. They, therefore, have issued special instructions to the Food and Drugs

TABLE D.

One Per Cent. Phenol, 1 C. C. Glycerin in 100 C. C. Solution (Distilled Water).

Mouse No.	Weight	Approximate amount of 1 per cent. solution of phenol per mouse	Phenol per gramme weight of mouse	Result	Time	
	Grammes				*H.*	*m.*
330	16.2	0.422	0.00026	Survived	..	..
331	19.15	.498	.00026	Survived	..	..
332	16.8	.538	.00032	Survived	..	..
333	19.55	.625	.00032	Survived	..	..
334	17.2	.654	.00038	Died	..	25
335	21.1	.802	.00038	Survived	..	..
336	17.5	.805	.00046	Died	1	15
337	23	1.06	.00046	Died	3	30

TABLE E.

One Per Cent. Phenol in Water (Mice had been Injected the Day Before with Varying Amounts of an 18 Per Cent. Solution of Ethyl Alcohol).

Mouse No.	Weight	Approximate amount of 1 per cent. solution of phenol per mouse	Phenol per gramme weight of mouse	Result	Time	
	Grammes				*H.*	*m.*
378	16.95	0.543	0.00032	Survived	..	..
379	18.35	.588	.00032	Survived	..	..
380	18.95	.721	.00038	Died	3	0
381	20.45	.780	.00038	Survived	..	..
382	21.05	.968	.00046	Died	20	0
383	20.65	.950	.00046	Died	35	0

Inspectors to be particularly alert for interstate shipments or importations of medicines, the makers of which allege that they will cure or alleviate this disease, for which, at the present time, no medicinal cure is known. The officials also warn the public that any preparation put on the market and offered for sale as being effective for the treatment of infantile paralysis should be looked upon with extreme suspicion. Inspectors, accordingly, have been instructed to regard as suspicious, and to collect samples of, all medicines in interstate commerce for which such claims are made. Makers of such fraudulent remedies will be vigorously prosecuted whenever the evidence warrants action under the Sherley Amendment to the Food and Drugs Act. So-called remedies for infantile paralysis which are offered for import into the country will be denied entry.

The Food and Drugs officials are particularly watchful in this instance because it has been noted in the past that whenever a serious epidemic exists unscrupulous dealers prey upon the fear or ignorance of the public by flooding the market with worthless, hastily prepared concoctions, for which they assert curative properties which have no foundation whatever in fact. In the present instance, inspectors already have discovered shipments of a few such mixtures.

The Department will do everything it can under Federal law to protect that portion of the public which is extremely credulous in times of panic and which will grasp at anything which promises protection or relief. The sale of such products at this time, the officials point out, is particularly threatening to the public health because many persons, relying on the false statements of impostors, neglect to secure competent medical advice. As a result, not only is the safety of the patient endangered, but, in the absence of proper sanitary precautions, the likelihood of contagion is greatly increased.

It must be understood, however, that the Federal Food and Drugs Act applies only to products which are shipped in interstate commerce, that is, from one State to another, or which are offered for import or export, or which are manufactured or sold within a territory or the District of Columbia. Products which are made and consumed wholly within a single State are subject only to such State laws as may apply and are under the control only of State health officials. The Federal law does not apply, for instance, to patent medicines made within the State of New York and sold in New York City. Persons buying or using a " remedy " made in their own State, therefore, must rely on the protection accorded them by their local health authorities.

BENZOIC ACID ADULTERATED.

Recent examinations by the chemists engaged in the enforcement of the Food and Drugs Act of shipments of benzoic acid offered for entry into the United States have revealed that much of it is adulterated with boric acid. This adulteration is probably due to the high price which benzoic acid now commands, owing to its scarcity. It is quoted at about eleven dollars per pound, while the price of high-grade boric acid is only twenty to twenty-five cents per pound. As some of the shipments of benzoic acid have been found to contain as much as thirty per cent. boric acid, the enormous profit in this form of adulteration is apparent.

The officials in charge of the enforcement of the Food and Drugs Act are of the opinion that benzoic acid containing boric acid is adulterated, and that shipments of such a mixture offered for entry into the United States should be denied admission under the Food and Drugs Act.

DRUG CULTIVATION IN NEW SOUTH WALES.

J. H. Maiden, F.R.S., F.L.S., Government Botanist and Director of the Botanic Garden, Sydney, states that the scarcity of crude drugs, due to the European war, has led the Australian Government to investigate the possibilities of cultivating several medicinal plants on its island-continent.

Like our own government, it has urged prospective growers to use precaution because of the possibilities of overstocking the market or producing an inferior drug. Technical knowledge is necessary concerning the seeds, propagation, soil, harvesting, etc.

The government, through experience, realizes the limitations of Australia in drug growing, and its advice is not to try to compete with other countries in growing cocoa, rubber, tea, cinchona, and jute. However, the following drugs should be grown successfully: Lobelia, broom, belladonna, digitalis, dandelion, chiretta, rue, horehound, aconite, squill, and savin. C. J. ZUFALL.

QUEBRACHO, CONCESSION ASKED FOR PLANT IN PARAGUAY.

Consul S. H. Wiley, Asuncion, representative of American capitalists, petitioned the Paraguayan Congress on July 6, 1916, to grant a concession for the erection and operation of a plant for the manufacture of extract of quebracho in Paraguay.

The most important concession asked is a reduction of the export duty on the extract of quebracho from $9.65 to $0.96 per ton, when the value of the extract does not exceed $96.50 per ton. When the market price on the bourse of Buenos Aires shall exceed this amount an *ad valorem* duty of 4 per cent. shall be paid on the excess. In addition to this, the concessionaire asks for exemption from import duty of machinery and other material used in constructing and maintaining his plant.

In consideration for the granting of the concession, the concessionaire agrees to advance the sum of $482,000 as a loan to the Paraguayan Government. The concessionaire also binds himself to produce not less than 15,000 tons of quebracho extract per annum.

C. J. Z.

NEW ZEALAND GOVERNMENT TO SELL KAURI GUM.

Consul General Alfred A. Winslow says that under the law authorizing the Minister for Lands to enter into contracts for the purchase of equipment for the extraction and treatment of kauri gum and the acquisition of supplies of the resin (see *Commerce Reports* for December 1, 1915), the New Zealand Government expended $131,440 for plant and stocks during the fiscal year 1915–'16. An agent in the United States, with headquarters in New York City (address obtainable from the Bureau of Foreign and Domestic Commerce or its district and coöperative offices upon asking for file No. 78,948), has been appointed to distribute the gum taken over by the government, and it is said that large stocks are in hand ready for the market. A government representative is now in the United States completing arrangements, having with him samples of the different grades for which orders may be taken, with the idea that the grades shall be guaranteed. It is also stated that the representative is in position to enter into contracts for large quantities covering any reasonable period and to guarantee delivery.

The New Zealand Government owns about 35,500 acres of excellent kauri forest, said to contain at least 15,000,000 feet of kauri lumber, which may be made to realize at least $45,000 per annum by bleeding these trees as rubber trees are bled. It is thought this tapping can be done for centuries if the forests are carefully treated. The exports of kauri gum from New Zealand in 1915 amounted to 4575 tons, valued at $1,358,401, against 8473 tons, value $2,420,811, during 1914; and up to March 10, 1916, the exports totalled 1096 tons, valued at $313,286. The United States not only takes the largest quantity of any country, but it also buys the most expensive grades, the average price per ton of the kauri gum taken by the United States being $333, contrasted with $264 for the United Kingdom.

SOME INSTANCES OF HOW THE PHARMACIST SERVES THE PUBLIC.

The value to the public of the educational bulletins issued by the Publicity Committee formed a very important topic for discussion at the recent meeting of the Pennsylvania Pharmaceutical Association at Reading. That the public is taking a keen interest in this work was emphasized by the numerous letters which have been received from residents of our own as well as other States regarding the cultivation of medicinal plants. Information regarding the kind of " weeds " which can be profitably grown by our country neighbors is best obtained from the Bureau of Plant Industry, Department of Agriculture, Washington, D. C.

President Campbell, in his address, recommended a mid-year meeting of the association in Harrisburg, should it become necessary to convince the Legislature of the need of proper pharmacy laws to safeguard the public It would be wise to have laws which will make it compulsory that all medicines sold in Pennsylvania should be put up under the supervision of registered pharmacists. The State already passes upon the ability of the registered pharmacist by compelling him to be a graduate of a reputable college of pharmacy, in addition to passing the very comprehensive examination of the State Pharmaceutical Examining Board. Such laws would help materially to prevent the sale of medicines, such as are frequently compounded by fakers and sold from house to house by many who have not even an elementary knowledge of pharmacy or medicine. The public should fight shy of purchasing cure-alls from wayside peddlers unless they bear the imprint of a properly qualified pharmacist or pharmaceutical concern.

The " high cost of being sick " naturally came into much prominence in the discussions. One fact particularly was brought out to show that the high cost of many chemical substances was due largely to the United States patent laws, which grant an inventor the sole right of manufacture for a period of 17 years. Our laws should be so modified that a manufacturer from any other country, who obtains a patent on a medicinal substance, should be compelled to arrange for its manufacture in this country within a reasonable time after the granting of the patent. We would then not find ourselves in the predicament which now confronts us, viz., being willing to purchase, but unable to obtain on account of conditions brought about by the war.

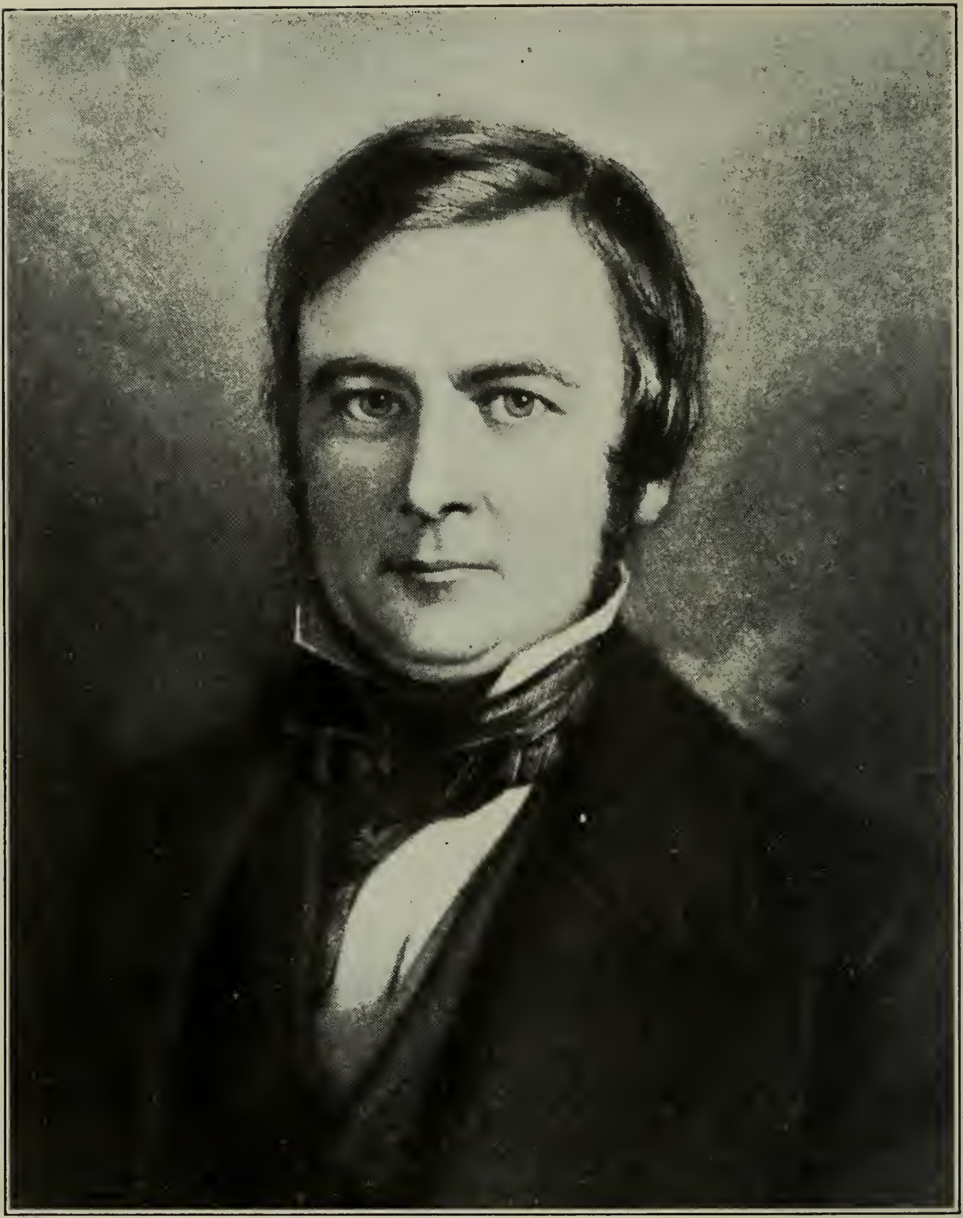
Nearly every one will realize the importance of protecting the "dye industry." Dyes have become scarce since the war began, and will become even scarcer as war continues. American capital is willing to engage in this industry if the government will enact protective laws which would prevent ruinous competition from abroad as soon as the war is over. Any dye factory erected in this country would become a potential factor of preparedness for our country, because the machinery so employed could readily be used for the manufacture of those basic substances necessary in the manufacture of explosives, should it become necessary.—*Pennsylvania Pharmaceutical Association Publicity Committee.*

A DIGEST OF U. S. P. CHANGES.

In order to show the busy pharmacist at a glance the important changes which have been made in the Ninth Revision of the U. S. Pharmacopœia, and to have this information on hand for ready reference, the H. K. Mulford Company, of Philadelphia, has prepared a list of the important pharmaceutical changes on a convenient card which can be posted in a conspicuous place in the prescription laboratory. This list is arranged in four columns and divided into chemicals, drugs, and preparations. Each pharmacopœial substance which has had its standard changed is placed under one of these three headings, and in the three adjoining columns the following information is given: The Eighth Revision Standard, The Ninth Revision Standard and Remarks on the Changes.

Thus, for instance, if one desired to know whether there had been any change in the standard for Extract of Nux Vomica, it would only be necessary to look under the heading of preparations, the sub-heading extracts, and then look for Nux Vomica in the regular alphabetical order. The information there given is that, according to the U. S. P. Eighth Revision, Extract of Nux Vomica contained 5 per cent. strychnine. According to the U. S. P. Ninth Revision, the same extract contains from 15.2 to 16.8 per cent. alkaloids from Nux Vomica. The remarks on the change are "standard now refers to total alkaloids and limits are given."

Of course, this list is for quick reference only, and full information must be sought in the Pharmacopœia itself. However, it is hoped that pharmacists generally will find such a ready reference of important changes both time saving and convenient. This card can be secured on application to the H. K. Mulford Company.



Dr. Joseph Carson
1808–1876

Photograph from a mezzotint in the possession of Professor Carson's son, the Hon. Hampton L. Carson, Philadelphia.

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OCTOBER, 1916

SOME OF THE EARLY TEACHERS OF PHARMACOGNOSY IN AMERICA.

By Henry Kraemer.

(*Continued from p. 401*)

Prof. Joseph Carson.

Dr. Joseph Carson succeeded Doctor Griffith and held the Chair of Professor of Materia Medica from 1836 to 1850. He is probably best known for his two books on medical botany, which were illustrated with 100 large colored lithograph plates. The volumes are dedicated to Dr. George B. Wood, and reveal the friendship and extent of the influence of the latter. While Doctor Wood wrote nothing that might be compared to this magnificent work, yet if he encouraged young men like Joseph Carson to follow their ideals and complete their allotted tasks, much credit is due him. This work is the first dealing with botany that bears the imprint of a professor in the Philadelphia College of Pharmacy on its title page. The work is not confined to indigenous medicinal plants, but embraces those of an exotic character. The illustrations are most beautiful and the text very illuminating. He was also editor of the American Journal of Pharmacy at the time of its greatest prosperity. His own zeal in his scientific contributions stimulated his colleagues and others to contribute equally valuable articles. It has always seemed strange to me that no adequate account of his life was published in the American Journal of Pharmacy, and that in connection with the names of the other illustrious members of our Faculty his should have been overlooked. It was largely with the idea of rectifying this omission that I prepared this address. I have been very fortunate to have the coöperation of his son, the Hon. Hampton L. Carson, to furnish me an accurate biographical sketch for inclusion here.

Joseph Carson, born in Philadelphia, Pa., April 19, 1808, died December 30, 1876, in his sixty-ninth year. His paternal ancestors, originally Scotch, passed, like so many of their countrymen, into Ireland, during the reign of the Stuarts, to escape religious tyranny. In 1735, three brothers, Andrew, William, and Joseph Carson, emigrated to America from Londonderry, and settled in Philadelphia, the latter (the grandfather of the subject of this notice) becoming a shipping merchant, who signed the non-importation agreement, and, like Robert Morris, loaned his credit to the Continental Congress, during the struggle for American Independence. His son, also named Joseph, was also a merchant, and married Elizabeth Lawrence, third daughter of Isaac Lawrence, who had removed from Newton, Long Island, to Elizabethtown, N. J., and there married Mary Ann Hampton, daughter of Jonathan Hampton, who was a captain in the Continental Army and had fought at Monmouth. Of their five children, the future Prof. Joseph Carson was the eldest.

His early education was obtained at the Germantown Academy, under the direction of John Brewer, a highly respected teacher in his day. Later he was placed under the tuition of a Mr. White in Philadelphia. As a boy he was studious and attentive, and at the age of fifteen entered the Sophomore Class of the University of Pennsylvania, at that time under the provostship of Rev. Frederick Beasley, D.D., from which he graduated as a Bachelor of Arts on July 27, 1826.

He then entered the drug store of Mr. Edward Lowber, and received an impulse to the study of botany, the doctor being a botanist. He soon became an enthusiastic lover of plants, making an extensive collection for an herbarium, and was led to investigate their medicinal virtues. Thus did he lay the foundation of his future work and fame as a botanist. He then entered as a private pupil the office of Dr. Thomas J. Hewson, one of the distinguished physicians of the day, and from his preceptor's office matriculated at the Medical Department of the University of Pennsylvania, receiving his degree of Doctor of Medicine in March, 1830. His graduating thesis was on "Animal Temperature," exhibiting research, method, clearness of thought, simplicity and directness of style, and sound reasoning, qualities which distinguished him as a writer and teacher in after-life. Soon after his graduation he was chosen one of the resident physicians in the Philadelphia Almshouse, then situated in Tenth Street, between Spruce and Pine. In the summer of

1831 he sailed as surgeon on the ship *Georgiana,* commanded by Captain John Land, for the East Indies, visiting Madras, Bombay, and Calcutta, returning to Philadelphia in August of 1832. He kept an interesting journal, with tables neatly and methodically arranged, of latitude and longtitude, the temperature of the sea and air, with excellent drawings, some of them colored, of the flora and fauna, and with an " Essay on Sea Sickness," with its physiological causes and conditions well presented.

On his return the yellow fever was raging in Philadelphia, and the young doctor so well performed his part that the tradition of his devotion and good judgment still survives. He then entered upon active general practice, eventually gaining an honorable place as a practitioner of obstetrics. The night work and exposure somewhat overtaxed his strength, and he gradually withdrew into more congenial and less exhausting fields of exertion, though never at any time abandoning general family practice. In 1836 he was chosen Professor of Materia Medica in the Philadelphia College of Pharmacy, a post which he held until 1850, when he was chosen to the same chair in the Medical Department of the University of Pennsylvania, as the successor of Dr. George B. Wood, a professorship which he held until May, 1876, when he resigned on account of ill-health, and was then made a Professor Emeritus. While occupying these positions he was librarian of the Academy of Natural Sciences for several years, building up and arranging its herbarium, and publishing a catalogue of its books. He edited the AMERICAN JOURNAL OF PHARMACY, assisted by Doctor Bridges, and later by Prof. William Procter, contributing twenty-six original papers. He was the first botanist to describe fully and give prominence to the genus *Alstrœmeria* as a source of edible fecula. At the same time he edited with notes two editions of Pereira's Materia Medica, and in 1847 published his beautiful illustrations of medical botany in two large quarto volumes, having drawn and colored many of the plates with his own hand. The plates were accompanied by descriptive letter-press, and were printed and issued by Robert P. Smith, of Philadelphia. Copies of this work are now hard to obtain and are highly prized.

In 1844 he added to his labors as a teacher by lecturing on pharmacy during many summers in the Medical Institute of Philadelphia, which had grown up as a summer school of medicine out of a private association of the pupils of Dr. Nathaniel Chapman. For five years

—from 1849 to 1854—he served as physician to the Lying-in Department of the Pennsylvania Hospital as the successor of Dr. Charles D. Meigs. He served as curator of the American Philosophical Society for seventeen years. As a member of the National Convention for Revising the Pharmacopœia of the United States, he served actively in 1860 and again in 1870 as the chairman of the Committee on Revision and as president of the Convention. In 1862 he was president of the Philadelphia County Medical Society, and was active as physician of the Foster Home and the Hospital of the Protestant Episcopal Church. In 1869, after years of patient labor, he published " A History of the Medical Department of the University of Pennsylvania, from its Foundation in 1765, with Sketches of the Lives of Deceased Professors." Upon this work his fame as a medical historian will safely rest. In the course of his preparation for this work he explored and established the connection between the most famous American school of medicine and the Medical Department of the University of Edinburgh, and made an interesting and unique collection of medical prints and autograph letters.

His medical literary career, beginning in 1835 with an " Essay on Egyptian Mummies," contributed to the *American Quarterly Review*, and ending in 1872 with ten chapters upon " Puerperal Eclampsia " and " Lectures on Emetics," embraced no less than seven closely printed pages of the mere titles of his papers, attesting the range and thoroughness of his scientific scholarship. His " Synopsis of Lectures on Materia Medica and Pharmacy," with lectures on the " Modus Operandi of Medicines," passed through four editions.

As a teacher he was a great favorite with his classes, always sympathetic and generous, and the recognized friend of students seeking aid and advice. A fluent but very deliberate speaker, an entire master of the branches that he taught, free from charlatanry, considerate and kindly, his career, as was said by one who knew him intimately well, " a fair exemplification of how much may be achieved by a man of industrious ways, coupled with absolute probity and good sense, in the face of restricted means and imperfect health."

In 1869 Professor Carson published " A History of the Medical Department of the Univeristy of Pennsylvania, from its Foundation in 1765, with Sketches of the Lives of Deceased Professors." This admirable work occupied much time in its preparation and entailed a large amount of work. In his characteristic liberal manner Doctor

Carson had cited the references from every source from which he obtained information. The following is a complete list of his articles which were published in the AMERICAN JOURNAL OF PHARMACY.

"On the Erythraea Chilensis," 1834, p. 276.

"Medico-Botanical Notices," 1837, p. 196.

"Notes on the Taccaceæ," 1837, p. 306.

"Notice of the True Jalap Plant," 1838, p. 28.

"Medico-botanical Notices," 1838, p. 105.

"Note upon Gentiana Chirayita," 1840, p. 20.

"Note upon the Cinchona Bicolorata," 1841, p. 49.

"Observations on Zamia Integrifolia—the Plant which Affords Florida Arrow Root," 1842, p. 22.

"On an Article Called Texas Sarsaparilla," 1843, p. 251.

"Notice of Some Brazilian Drugs," 1845, p. 8.

"Drimys Chilensis DeCandolle, the Winter's Bark of Chili," 1847, p. 81.

"Drimys Winteri (Forster) DeCandolle, (Winter Bark Tree), with a Figure," 1847, p. 161.

"An Essay on Scammony, with an Examination into the Qualities of the Drug Found in the Market," 1848, p. 1.

"Article on Black Helebore (Helleborus niger)," 1848, p. 161.

"Article on Quassia Amara, L." (with a Plate), 1848, p. 257.

"Article on Quassia Excelsa" (with a Plate), 1849, p. 1.

"Note on India Opium," 1849, p. 193.

"Note on India Cinnamon and Red Sarsaparilla," 1849, p. 296.

"Note on Nectranda Puchury, Major and Minor, as the Source of Pichurim Oil and Pichurim Bark and Bean of Commerce," 1855, p. 385.

"Note upon the Fecula of Alstrœmeria," 1860, p. 289.

"On the Source of Balsam of Peru," 1860, p. 296.

PROF. ROBERT P. THOMAS.

Dr. Robert P. Thomas succeeded Professor Carson on his election as Professor of Materia Medica in the University of Pennsylvania. He was probably the ablest lecturer on materia medica in the United States at that time. There was only one man his equal, and that was Dr. George B. Wood, who, as we recall, retired from professorial duties in 1859. There is a very appreciative sketch of him in the AMERICAN JOURNAL OF PHARMACY of 1864, pp. 191 and 277.

His decease at the age of 43 was rather pathetic, as it occurred within 48 hours of the conclusion of one of his lectures. He was stricken down with spotted fever the morning after this lecture and died the following day. It was a great blow to his students and his colleagues at the College. The esteem in which he was held is best shown by the resolutions of the Zeta Phi, a student association of the College, and of which committee Albert E. Ebert was chairman, which read as follows:

"WHEREAS, It has pleased an All-wise Providence to remove from amongst us our worthy and esteemed professor, Dr. Robert P. Thomas, who has so long filled the Chair of Materia Medica in this College; therefore,

"*Resolved*, That we, as members of the 'Zeta Phi Society of the Philadelphia College of Pharmacy,' tender to the afflicted family of Dr. R. P. Thomas our heartfelt sympathy in their irreparable loss.

"*Resolved*, That we sympathize with the Board of Trustees and the College at large in the loss of so talented and warm-hearted a fellow-member, cut off suddenly as he has been in the midst of his usefulness and growing reputation.

"*Resolved*, That the members of this society, who have listened to his clear and lucid instruction, and have felt the influence of his calm and courteous demeanor, will ever cherish the remembrance of his virtues, and, we trust, will be influenced by his example throughout our lives.

"*Resolved*, That this preamble and resolutions be entered on the minutes of this society; that a copy be forwarded to the family of the deceased, and another to the Trustees of the College."

Doctor Thomas was distinguished from his predecessors more especially for consideration he gave to the drugs of the market, and to-day would be ranked as a pharmacognocist. He revised both the formularies of Griffith and Ellis, and besides wrote a great many papers which were published in the AMERICAN JOURNAL OF PHARMACY and the *Proceedngs of the A. Ph. A.*

Doctor Thomas was born May 29, 1821, the year of the founding of the College, and might be well termed one of its founders, by virtue of the work which he accomplished. He was one of the first members of the Faculty who ended his career in its services. His biography is exceedingly stimulating. He worked his way up at great odds, and at the time of his untimely death was one of the most beloved and influential teachers in Pharmacognosy. His early

Dr. Robert P. Thomas
1821–1864

education was in the Westtown Boarding School, in Chester County, Pa. Here he gained a good English education, with the rudiments of classical learning, and doubtless acquired that taste for natural science which was conspicuous in his later years. At the age of 16 he entered the counting-house of a firm of shipping merchants. His ambition, however, was directed toward the medical profession. He employed his hours of recreation in acquiring knowledge and improving himself. In order to promote his medical education, he obtained the appointment, at the age of 24, as assistant apothecary to the Philadelphia Dispensary, a position he filled for a year, with great fidelity and satisfaction to all with whom he was associated. In the year 1847 he took the degree of Doctor of Medicine in the University of Pennsylvania.

Doctor Thomas must have had his full share of those discouragements which await the young physician during the years which, in a large city, invariably intervene between the period of graduation and the time in which his talents and industry may win for him an honorable reputation and an independent support. No special good fortune surrounded his entrance upon his chosen career, and he was dependent upon his own indomitable energy and perseverance, with the encouragement of strong friends, for the degree of success to which he attained. His first teaching position was as demonstrator of anatomy in the Franklin Medical College. He was elected to the Chair of Materia Medica when Doctor Carson vacated it for a similar position in the University of Pennsylvania. He immediately entered on the duties of his office with characteristic zeal, and from the first fulfilled its requirements to the entire satisfaction of all. With the class he was popular, from the clearness of his instructions, the urbanity of his manners, and the genuine goodness of his heart. To the members of the College, who came in contact with him at its meetings and elsewhere, he attached himself closely in relations of confidence and friendship.

In the investigation and illustration of his lectures Doctor Thomas was indefatigable, and, while he added to his own cabinet, he enriched also that belonging to the College. His writings, published in the American Journal of Pharmacy, in the *Proceedings of the A. Ph. A.*, and elsewhere, evince close observation and analysis, and are written with clearness and perspicuity. Of these we may specify his paper on "Texas Sarsaparilla," published in 1855, showing that this drug is not identical with the true Sarsaparilla; his paper on "Garlic," published in 1860, describing a variety of this drug found in the Philadelphia market, and which, he concludes, is not a distinct species, but a hybrid, partaking of the nature of the garlic and of the leek; and a short essay on the "Culture of Elaterium," in 1862—all exhibiting evidences of his talent and industry in the special department of Pharmacognosy.

Some interesting experiments on the influence of morphia in the color-test for strychnia, detailed in a paper published in the *American Journal of Sciences,* were exhibited by him at one of the Pharmaceutical meetings of this College in 1861. The presence of morphia was shown to modify the color-test for strychnia, as first ascertained by Dr. J. J. Reese, so as to render it quite unreliable for medico-legal investigations, as usually applied. He suggested the admirable expedient of isolating the strychnia from the morphia, where they are associated, by use of chloroform in the presence of an excess of caustic potassa, thus avoiding the interference in cases requiring the test.

The most extensive editorial labors of Doctor Thomas were connected with the revision of "Griffith's Universal Formulary" and "Ellis's Medical Formulary."

"The death of Dr. Thomas was sudden and very unexpected. He lectured to his class in this College on the evening of the first of February, apparently in health, and rather unusually lively and full of anecdote. By those closely connected with him, however, it was observed that he appeared not as well as usual, and on the following morning, although he rose, he complained of symptoms which induced him to forego his usual round of duties, and very soon after to retire to bed. Alarming symptoms soon appeared, which called for prompt efforts to stay the progress of a disease which was rapidly loosening his hold on life. Every effort failed, and in thirty-six hours from the first appearance of the disease his spirit passed away. A subtle epidemic influence, which has visited many of our citizens during the past winter and has been generally characterized as spotted fever, is believed to have undermined thus rapidly his vitality without developing its usual visible signs. Thus, in the forty-third year of his age—in the full strength of manhood—with energies unrelaxed, and girded with the strength of experience for future usefulness—our associate, friend and preceptor, has been called from among us."

PROF. EDWARD PARRISH.

The seventh incumbent of the Chair of Materia Medica was Prof. Edward Parrish. He ordinarily is classed among the eminent professors in pharmacy of this College. His career is exceedingly interesting. He was a scholar, an associate of men of letters, a born teacher, and a great executive. He possessed those qualities of mind and heart which caused him to adorn and develop every activity with which he was connected. His work in the Philadelphia College of Pharmacy, in the development of Pharmacognosy, is worthy of more than passing interest. It will be noted, of the six professors who held the Chair of Botany and Materia Medica, that all of them were medical men. Indeed, it was the established tradition that one of the qualifications for this position was that the candidate should possess the degree of M.D. Upon the resignation of Doctor Carson in 1850, Professor Parrish was a candidate, and he failed of election because of the tradition referred to. Upon the death of Doctor Thomas in 1864, Mr. Parrish again became a candidate and was elected, and held that position until 1867, when he exchanged professorships with Professor Maisch, who was then Professor of Pharmacy. As we shall see later, Professor Maisch was eminently qualified for the position in botany and materia medica, but probably could not have been elected directly by virtue of the prevalent tradition. It is thus seen that Professor Parrish's entrance into the Faculty of our College was the means of establishing a new precedent, and one which rightfully should be followed. It was this era to which Professor Carson had reference in his "Memoir on Samuel Jackson" when he stated that during the early days of the College the members did not feel that there were any pharmacists of sufficient calibre to assume the great responsibility of instructing the students of the College. Professor Parrish is especially known to pharmacists through his book on "Practical Pharmacy," the first edition of which appeared in 1855. He also prepared many important addresses, and some of them relating to the history of our College are very illuminating. Professor Parrish published a number of papers on pharmaceutical subjects, a large number being strictly of a pharmacognostical character; the latter are of very great value and touch upon practical questions, being worthy of a place in the history of practical pharmacognosy. Professor Parrish always took an active part in legislative work as related to pharmacy, and was instrumental in securing the Pharmacy Act of 1872. He was also one of the founders and the first president of Swarthmore College.

Professor Parrish came of old Quaker stock, the family being older even than the State of Pennsylvania itself. The members have been known particularly for their educational work, and the name and career of Edward Parrish stand out very prominently. He was born in 1820 and graduated from the Philadelphia College of Pharmacy in 1842. In the following year he became a member of the College and from 1854 to 1864 was Secretary of this Institution. Very early he began to engage in research and literary work and we find in 1842, in the AMERICAN JOURNAL OF PHARMACY, a publication of his graduation thesis entitled "Statice Caroliniana, with the Chemical Analysis of the Root of this Plant." The work was very carefully done and his results still stand as authoritative with regard to constituents of this drug. Among his contributions to pharmacognosy which were published in the AMERICAN JOURNAL OF PHARMACY the following may be mentioned:

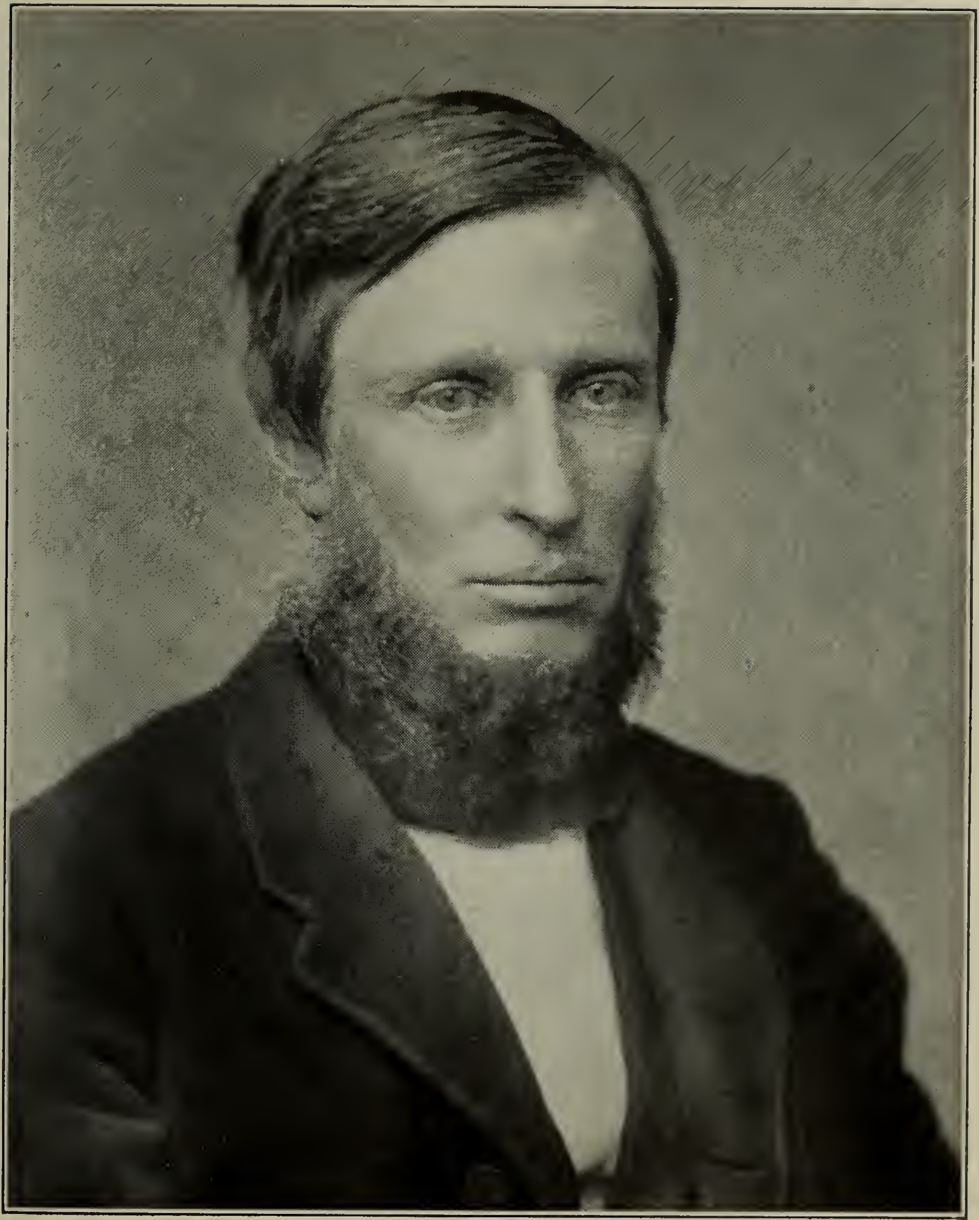
The Cultivation of Opium in Armenia. Being a translation from the French of M. H. Gaultier de Claubry, 1849, p. 14.

Notes on the Following Barks: Melambo or Matias Bark; Soap Bark and Quassia Bark, 1857, p. 103.

Pharmaceutical Notes of Travel, 1859, pp. 1, 97 and 209.

Lactucarium and its Preparations, 1860, p. 225.

The extent of Professor Parrish's influence is seen from the incident which occurred on May 10, 1909, and which is related in the AMERICAN JOURNAL OF PHARMACY FOR 1909, p. 306. This day marked the 43rd anniversary of the laying of the corner-stone of Swarthmore College by Prof. Edward Parrish, its first President. A number of friends and former students of Professor Parrish spent the morning at Swarthmore and repeated "the experiences of May 10, 1866, when the Friends held a picnic to enjoy the natural beauties of the splendid site upon which Swarthmore College stands." Professor Parrish's son, Edward Parrish, a grandson and great-grandson were present. Dr. Joseph Swayne, President of Swarthmore, received the party and showed them through a number of the buildings. A few plants were collected and a picnic luncheon was held in the gymnasium of Swarthmore College. During the afternoon of the same day a memorial celebration was held in the Museum of the Philadelphia College of Pharmacy, when a portrait of Prof. Parrish was presented to the College. The assemblage was



Prof. Edward Parrish
1820–1872

a notable one and Mr. Isaac Clothier, Chairman of the Board of Managers of Swarthmore College, paid the following tribute to his memory: " Professor Parrish," he said, "had a wonderful amount of knowledge. All nature was open to him and everything they met in rambles in the open country appeared to be known to him. In the founding of Swarthmore College Professor Parrish was among the active workers, and he was recognized as a leader and an inspiration in all of the activities of the College. He travelled about the country and gave largely of his time to secure the funds for its establishment, and without him it would have been impossible to found this College." He was unanimously selected its first president, and Mr. Clothier stated that he well remembered his presence and the timely and wise words uttered by him at the laying of the cornerstone of the college building. In closing he said: "It is unusual forty years after, for one's friends to gather together and pay such a tribute to the memory of a man."

Professor Parrish died on September 9, 1872, at Fort Sill, Indian Territory. He had accepted an appointment by the Government to visit the Indian tribes located in the Indian Territory and while in the discharge of his duties fell a victim to the miasmatic fever then prevalent in that country. (A. J. P., 1872, p. 469.)

PROF. JOHN M. MAISCH.

Professor John Michael Maisch, the eighth Professor of Botany and Materia Medica in the Philadelphia College of Pharmacy, was among the influential men of his time. He was born in Hanau, Germany, on January 30, 1831, and died on September 10, 1893. His life and work seem almost too recent for me to attempt to write an extensive sketch of his career. In fact, the memoir of him by Mr. M. I. Wilbert, published in the AMERICAN JOURNAL OF PHARMACY of August, 1903, is quite comprehensive and appreciative of him, containing as it does a complete list of his writings. It is for this reason that it seems unnecessary for me to attempt to enlarge on his work at this time.

Professor Maisch was an indefatigable worker, a voluminous reader and an extremely facile writer. He wrote nearly 300 original articles and was particularly known as the author of a text-book on " Organic Materia Medica," and as a collaborator with Dr. Stille on the National Dispensatory. His labors extended beyond the confines of the Philadelphia College of Pharmacy. He was very active in the work of the Pennsylvania Pharmaceutical Association and the American Pharmaceutical Association. He was closely in touch with the representatives of all phases of pharmaceutical work and used his position as Secretary in these two Associations to advance the profession of pharmacy. By virtue of his professorship in the Philadelphia College of Pharmacy and his position as Editor of the AMERICAN JOURNAL OF PHARMACY, he came in touch through correspondence with the leaders in pharmacy throughout the world. As showing the appreciation of his labors he was made an honorary or corresponding member of 43 Pharmaceutical and Scientific Societies in this country and abroad.

Professor Maisch was a tall man, well proportioned and of great strength. He possessed those traits of character which caused him to be looked upon as an authority and to win the reverence of all those who had the good fortune to study under him or become associated with him. He had a slight foreign accent, which in my judgment was rather pleasing, and he lectured with a simplicity and directness that characterizes a great teacher. His lectures were lucid and illustrated with an abundance of material that represented his own knowledge concerning drugs and their properties. To me personally he was an inspiring lecturer; my own career has been largely shaped by contact with him as a student and afterwards as a friend. He awakened in me a desire to pursue botanical and pharmacognostical work, and while I had expected to use my pharmacy course as a preliminary step towards securing a medical education, I abandoned this determination before graduating in pharmacy, and made up my mind to devote myself to botanical and pharmacognostical investigations, if it were possible for me to do so. After completing the courses of instruction under Professor Maisch, I came to know him quite well, receiving from him much encouragement and inspiration. I sat with him in his study at his home on very many occasions, discussing subjects of much interest to me. He was a man of strong personality and possessed a powerful mind that was a veritable store-house concerning men and their work. His book on "Organic Materia Medica" was the first book published in the United States on practical pharmacognosy. It was of very great value in the drug store and the laboratory and was the standard work on pharmacognosy for many years. As I go over the collections in the College scarcely a day passes that I am not reminded of him and his work for pharmacy and I am indeed grateful that I was a student under him.

Probably no eulogy of Professor Maisch surpasses the words of appreciation that were spoken by Mr. Charles Bullock, President of the Philadelphia College of Pharmacy at the time of his decease. He said: "There are occasions in the history of institutions, as well as in the domestic circle, when death spreads a dark mantle over our thoughts of temporal affairs and a heavy cloud obscures the future, while we look back upon the past illuminated by the remembrance of the life which has ceased after the work of the day has been accomplished. The Board of Trustees, his Associates in the Faculty, and you, my fellow-members, feel keenly the loss which we have sustained, yet with our sorrow should be mingled the remembrance that we have been partakers of the fruit of the labor of his life, benefits which will be a lasting memorial of his ability and devotion to the purposes and interests of this College. To few are given the various attainments possessed by Prof. Maisch. He was devoted to the department of Science which he had chosen for his special work. As a teacher he was laborious and untiring in his endeavor to bring before his classes all important features pertaining to Materia Medica and Botany, and while an instructor, he was himself a diligent student during his whole life. His retentive memory was an encyclopedia of information, and rarely was he found to be wanting or incorrect in his information. As Editor of the JOURNAL of the College for 22 years he discarded all matter not relevant to the true interests of the pharmaceutical science; while his ready discrimination enabled him to sift rapidly the literature of his profession. When occasion required criticism, it was done in the kindly spirit characteristic of a mind in pursuit of facts, and not for antagonism. The amount of labor which he performed as Author, Editor, Permanent Secretary of the American Pharmaceutical Association for a long course of years, attest the activity and ability of his well-balanced mind. His character in private life is well known to all of us, and requires no eulogy from me. It is not the purpose of your committee to sketch at this time a general outline of the life of our departed Associate; a suitable memoir will be prepared hereafter for publication in the JOURNAL of the College. A strong man has been taken from us; let us endeavor to honor the memory of Prof. Maisch by a renewal of our interest in this Institution to which he was devotedly attached, and seek to maintain the high character of the chair left vacant by his decease."

Prof. Edson S. Bastin.

Prof. Edson Sewell Bastin was a pioneer laboratory worker in microscopy. Some time during the early eighties he established the first botanical and microscopical laboratory in the Chicago College of Pharmacy and upon his acceptation of the chair of Botany and Materia Medica in the Philadelphia College of Pharmacy in 1893, he again organized a laboratory and insisted that microscopical instruction become a part of the regular curriculum of the students receiving their degrees in pharmacy. Professor Bastin was of a modest and retiring disposition and was personally comparatively little known. His influence, however, through his books was nation wide. His two books entitled " Elements of Botany " and " College Botany" were widely used, being employed as text-books not only in Pharmaceutical Schools but High Schools, Colleges and Universities. His work on "College Botany" was in use as a text-book at Columbia University when I was a student in 1891.

Professor Bastin was born in Ozaukee County, Wisconsin, on May 29, 1843, and died on April 6, 1897. An appreciative memoir of him was written by Professor Trimble in the American Journal of Pharmacy for August, 1897. Professor Trimble was very closely associated with Professor Bastin and encouraged him to publish his scientific researches on the histology of American medicinal plants. These two men collaborated in the publication of a posthumous work on the " North American Coniferae." This was a very important contribution to the inner morphology and constituents of quite a number of trees and shrubs of this family, showing something of their natural relationships and the origin of some of their constituents. These papers are frequently consulted by scientific workers and it is rather a happy incident that links the names of these two men of sterling character and love of science.

Professor Bastin did not publish very many articles before coming to Philadelphia. His noteworthy articles were published in *"The Apothecary,"* a journal edited by Prof. Oscar Oldberg, of North Western University. The titles of these earlier papers have been given by Prof. Trimble in his memoir. In addition to the article on the Coniferæ, above referred to, he published the following list of articles in the American Journal of Pharmacy during the three years that he was connected with the Philadelphia College of Pharmacy:

Economic Botany, 1894, p. 283.

Starches in Different Commercial Varieties of Cacao, 1894, p. 69.

Structure of Podophyllum, 1894, p. 417.

Structure of Heuchera Americana, 1894, p. 467.

Structure of Geranium Maculatum, 1894, p. 516.

Structure of Asarum Canadense, 1894, p. 574.

Some Further Observations on the Structure of Sanguinaria Canadensis, 1895, p. 4.

Structure of Iris, 1895, p. 78.

Structure of Cimicifuga, 1895, p. 121.

Structure of Veratrum Viride, 1895, p. 196.

Structure of Epigaea Repens, 1895, p. 231.

Structure of Sassafras, 1895, p. 312.

Structure of Our Hemlock Barks, 1895, p. 356.

Structure of Our Cherry Barks, 1895, pp. 435 and 595.

Are They Roentgen Rays? 1896, p. 142.

An Instructive Floral Monstrosity, 1896, p. 430.

Professor Bastin was a self-educated botanist, and was interested in plants from his early youth. He had something of the natural instinct of a botanist in him and acquired a proficiency that was in some respects remarkable. He was very thorough and painstaking in his work. His word of caution to the student in his "College Botany" reads very much like the admonition of Agassiz, who said "Study nature, not books." Professor Bastin wrote: "Remember that the study of Botany is primarily the study of plants, and not the study of books about plants. If you study the book only, you will almost certainly find it dry and unprofitable, but if you use it as a guide to the study of plants, and study it *plant in hand,* verifying its descriptions by observations of your own, you will find the work not only profitable, but intensely interesting."

CONTINUATION OF ARTICLES.

Mr. Wilbert reminds me that there were several very practical pharmacognocists who antedated the work of any of those that I have mentioned. At some later date I am disposed to assemble my biographical studies of these men, and to include them in an article.

Prof. Lloyd has sent me a note in regard to Prof. Jackson with whose sketch I began this series of sketches. This is taken from an article by Prof. Lloyd, which is to appear in the *Eclectic Medical*

Journal for October, 1916. He says: "About the same date as the introduction of Compound Syrup of Hypophosphites, the talented Professor Jackson, of Philadelphia, deviser of 'Dr. Jackson's Cough Syrup' (a morphine compound, once very popular), theorized that a deficiency of bone substance could be overcome by artificial means, by feeding soluble calcium phosphate to people thus afflicted. Thus was introduced the *Compound Syrup of the Phosphates,* containing the 'phosphates of iron, lime, soda and potassa,' the chief among its ingredients being calcium phosphate. This pharmaceutical preparation appearing simultaneously with 'Churchill's Consumption Cure,' and being likewise colorless, and the term phosphate resembling phosphites, needed to be distinguished from the then popular Compound Syrup of Hypophosphites. To prevent the confusing of the two syrups, whose names were, to ignorant people, very similar, Mr. Gordon and others colored the Compound Syrup of the Phosphates red with cochineal, and strongly flavored it with spearmint. This was a very necessary precaution in those days, when remedies such as these were sold in large amounts over the counter to consumers. However, 'Jackson's Bone Food' did not become popular, for it did not prevent, or overcome, for example, a weakness in children leading to their becoming bow-legged. It was demonstrated conclusively, we take it, that artificially prepared phosphatic food did not parallel the life-involved phosphatic compounds found in vegetation. Long since passed away 'Jackson's Bone Food,' but 'Churchill's Consumption Cure' remains with us to-day."

THE PHARMACEUTICAL EXHIBITION IN PHILADELPHIA.

By M. I. Wilbert, Washington, D. C.

The exhibition held by the Philadelphia College of Pharmacy, August 30th to September 30th, 1916, in connection with the 50th anniversary of the founding of the Alumni Association of that institution, might at the same time have been considered as an exhibition in celebration of the centenary of the introduction of systematic pharmaceutical training in this country.

It was on October 4, 1816, that the Board of Trustees of the University of Pennsylvania established a faculty of natural sciences. This faculty consisted of a Professor of Botany, a Professor of Natural History, including Geology and Zoology, a Professor of

Mineralogy and Chemistry and a Professor of Comparative Anatomy.

In connection with this course on the natural sciences, Dr. James Mease, better known as one of the historians of Philadelphia, was given permission by the Board of Trustees of the University of Pennsylvania to open a regular course of lectures on pharmacy in the University of Pennsylvania. In effect, therefore, the University of Pennsylvania offered to pharmaceutical students a very comprehensive course of study along the lines followed in Universities of Continental Europe, but one that is not duplicated, in this country, even at the present time.

Dr. Joseph Carson, in his history of the medical department of the University of Pennsylvania, does not outline very clearly the period during which the combined courses in the natural sciences and in pharmacy were conducted in that institution, but the records of the Board of Trustees show that Dr. Mease continued his lectures during the year 1816–1817 and that in the fall of 1817 he was again given permission by the Board of Trustees of the University of Pennsylvania to inaugurate the course of lectures on pharmacy in the University of Pennsylvania. A letter from James Mease, printed in Thacher's American New Dispensatory, Boston, 1821, would indicate that Mease was conducting his course of lectures on pharmacy in 1818 and it is quite probable that this course was continued up to and including the time of the proposed granting of the degree of Master of Pharmacy by the University in 1821. As is well known this action led to the organizaton of the Philadelphia College of Pharmacy and probably involved the discontinuance of the course of pharmacy at the University of Pennsylvania, though there is a record of the bestowal of the degree of Master of Pharmacy, in course, some years later.

The course in the natural sciences as organized in 1816 included such well known men as Dr. William P. C. Barton as Professor of Botany, Dr. Charles Caldwell as Professor of Natural History, Dr. James Cooper as Professor of Mineralogy and Chemistry, Dr. Thos. T. Hewson as Professor of Comparative Anatomy. All of these men are well known in that they took a very active part in the development of the sciences relating to medicine and the affiliated branches.

Among the more interesting features of the exhibition held in the Museum of the Philadelphia College of Pharmacy the most impressive was a reproduction of a typical Philadelphia drug store of a century ago. This shop was a reproduction of the store of Dr.

George Glentworth at Chester and Race Streets and included many curious historical relics. Contrasted with this shop of the long ago was a suggestion of a modern up-to-date pharmacy sufficiently equipped with the scientific laboratories required at the present time to coöperate with the medical profession in the modern practice of medicine. This modern pharmacy is equipped with a refrigerator safe for the keeping of biological products, a chemical laboratory for the systematic examination of chemicals and their preparations, a pharmacognostical laboratory for the examination of drugs, a bacteriological laboratory for the detection of bacterial contamination and the control of solutions and medicines, and a manufacturing laboratory for the production of galenical preparations and such other forms of medicines as can economically be produced in the present-day pharmacy. The dispensing room which is shown in connection with the show room contained a model five foot shelf of books that should be found in every up-to-date drug store.

Among the more interesting of the general exhibits there was shown for the first time a copy of the Pharmacopœia of the United States of America, Ninth Decennial Revision. The National Formulary, 4th edition, was also on exhibition. These two books, while they were decreed as being official from September 1, 1916, were generally unobtainable on that date. It is little wonder, therefore, that pharmacists who had the pleasure of being able to attend during the opening days of the exhibition almost invariably devoted more time to these new, but as yet rare, books than to any other portion of the show.

In connection with the exhibition of pharmacopœias, there was a complete set of the Pharmacopœias of the United States and a representative showing of the pharmacopœias of the several nations of the world. There was also on exhibition a complete set of the several editions of the United States Dispensatory and a considerable amount of material illustrating the methods employed and the character of the work done by the Committee of Revision of the United States Pharmacopœia VIII. In this connection there is shown a complete set of the earlier "Digest of Comments" on the Pharmacopœia; also a complete set of the present "Digest of Comments on the Pharmacopœia and the National Formulary." Attention was directed to the comprehensiveness of the latter publication by a sign which read: "Digest of Comments, originated by Charles Rice, has grown to be the greatest work of reference on the U.S.P. and N.F."

Drugs of all kinds, particularly botanical drugs, are much in evidence. A very large number of herbarium specimens and even growing plants were on exhibition. Among the growing plants there was a fairly large camphor tree; this was accompanied by a liberal sample of camphor presumably made in the United States. Illustrative of the uncommon chemicals made in this country at the present time there was a sample of atropine made from wild-growing stramonium by Eli Lilly and Company with the use of Lloyd's reagent.

Several firms showed biological products and an additional number exhibited pharmaceutical products that were biologically standardized. Considerable apparatus for the biological standardization of drugs was shown both by users and manufacturers of this apparatus and several novelties in this direction attracted considerable attention.

A complete set of the AMERICAN JOURNAL OF PHARMACY from 1825 to 1916, with an exhibition of portraits of the several editors and reproductions of the illustrations used in some of the articles, constituted an unusual and extremely interesting part of the general exhibit.

The interest that has more recently been taken in the cultivation of drugs was well evidenced by a collection of photographs of drugs and growing plants from the drug garden of the University of Minnesota, at Minneapolis. These photographs were placed on exhibition by Professor Newcomb and their comprehensiveness and mechanical excellence served to attract considerable attention.

Among the chemical exhibits, one by The Powers-Weightman-Rosengarten Co., included both crude materials and finished products. This exhibition from an educational point of view was exceptionally valuable. A collection of magnesia products by Keasbey and Mattison, of Ambler, Pennsylvania, was interesting in that it served to show the varied uses to which magnesia products are being put at the present time. Burroughs and Wellcome, two graduates of the Philadelphia College of Pharmacy, now in England, took an important part in the exhibition by the presentation of books, chemicals and pharmaceutical preparations.

The physiological standardization of galenical preparations was everywhere emphasized and the exhibition as a whole not alone served to call attention to the evolution of pharmacy during a century but also served to suggest the inevitable and possibly radical development of scientific pharmacy in the very near future.

SOME EXPERIENCES IN PREPARING EMULSION OF SILVER IODIDE.[1]

By JOSIAH C. PEACOCK and BERTHA L. DEG. PEACOCK.

The so-called emulsion of silver iodide is a suspension of this compound in some suitable vehicle. It is probably well known to some and a total stranger to many others.

This subject has been treated by Mr. M. I. Wilbert in the AMERICAN JOURNAL OF PHARMACY for February, 1906, and by Mr. J. K. Thum in the same journal for November, 1910, and November, 1915. Mr. Wilbert, where cited, mentions the availability of Irish moss, quince seed, salep and tragacanth as suspending media, and suggests a type-formula in which the silver iodide is first produced and then suspended in mucilage of Irish moss. Mr. Thum used the yolk of fresh eggs with ideal results, but brought about the formation of silver iodide in the presence of the yolk, instead of first forming the silver iodide and then suspending it as suggested in Mr. Wilbert's formula. Mr. Thum described mucilage of Irish moss as being, next to the egg yolk, the most efficient and satisfying agent. Mr. Thum also used solutions of gelatin ranging in strength from 0.1 to 0.5 per cent., which after frequent shaking during twenty-four to thirty-six hours brought the silver iodide into suspension; the solution containing 0.3 per cent. gelatin is mentioned as giving almost perfect results.

But it was our good fortune to be ignorant of this specific information, when about two years ago a physician gave an order for some five per cent. silver iodide emulsion to be ready in half an hour. We knew how to make silver iodide, but we had never been called upon to suspend it, and our inexperience in the matter gave us no little concern as we reflected on the possibility of turning out a satisfactory product.

We knew that an " emulsion " of silver iodide is used for photographic plates, and that gelatin is employed in this connection as the emulsifying agent, but not in a manner fit for our needs. Running over the list of eligibles in our minds, we felt that any one of several mucilages recalled might be as well suited as gelatin, and some one among us in the store remembered having heard of mucilage of Irish moss being used for the purpose. Coincidentally we were thinning some mucilage of tragacanth for pasting labels, and grasping the opportunity we took advantage of its readiness, and in less than the allotted time had an emulsion of fine appearance in the physician's hands. He remarked that he would need more within a few days, so we immediately prepared another portion with the mucilage of tragacanth, both to be ready and also to learn how well it would keep. For comparison, another lot was made with the aid of mucilage of Irish moss. Within a few days the emulsion produced with tragacanth had begun to darken somewhat and showed a tendency to settle a coarse curdy precipitate, while that made with Irish moss retained its light yellow color and consistence for a much longer time. In fact, the color never perceptibly changed, although the silver iodide settled to some extent in the bottle.

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[1] Read at the annual meeting of the Pennsylvania Pharmaceutical Association, June, 1916.

Later, the physician reported that the lot which he received had retained its original appearance until used. But the use of Irish moss mucilage had, to our minds, improved the appearance and stability of the product so greatly that we decided to use it until an opportunity to look further into the matter of suitable suspending agents should come.

Accordingly, we examined mucilages made from sassafras pith, flaxseed, salep, elm, quince, dextrin, starch, and acacia, all of which are well known in use as emulsifying agents and emollient vehicles. We also repeated our experiments with tragacanth and Irish moss, and at the same time tried solutions of gelatin and egg albumen. Yolk of egg was not tried during this period, for it was looked upon as of itself too readily changeable.

After our experiments had been made and our conclusions drawn, we were apprised of the articles written by Mr. Wilbert and Mr. Thum. We have said it was our good fortune to be ignorant of the specific information given by these gentlemen; now the reason for so saying is not that we do not appreciate their work nor declare for their priority on all points in common, but had we known of their publications we most likely would not have made the many experiments performed for the purpose of this paper, and thereby would have been deprived of such knowledge as we have gained through personal experience with this subject. However, we present our experiences because they not only essentially conform to and thus confirm the statements of these gentlemen, but also mention some matters of interest not touched upon in their contributions.

Our object in making these experiments was to devise a plan to quickly produce a finely divided suspension of silver iodide and do so by introducing as little suspending material as possible.

Silver iodide is affected by light, especially the actinic rays, when concentrated by a lens, but it is not so rapidly affected by diffused daylight or artificial light that it shows perceptible change in the time required to make an emulsion, and for that reason none of these processes need to be conducted in a dark room. Indeed, silver iodide has proven to be so permanent in these emulsions that we look upon the theory of its use as an antiseptic as somewhat of a conjecture of fact and fancy, to be settled by each practitioner for himself.

Unless otherwise specified our experiments were made on the basis of five per cent. silver iodide. Where a recognized formula for a mucilage existed, the prescribed strength and mode of preparation was followed, and the product used in the first trials with each individual mucilage.

The amounts of silver nitrate and potassium iodide needed to give the required quantity of silver iodide were calculated from the terms of the following well-known reaction:

$$\begin{array}{ccccccc} AgNO_3 & + & KI & = & AgI & + & KNO_3 \\ 168.69 & & 164.76 & & 233.02 & & 100.43 \end{array}$$

the symbols of which, designated in molecular weights, as shown under them, respectively, indicate that 168.69 parts of silver nitrate require 164.76 parts of potassium iodide to produce 233.02 parts of silver iodide with the simultaneous formation of 100.43 parts of potassium nitrate.

In the course of this paper it will be pointed out that the specific gravity of mucilage of Irish moss, no matter how long macerated when prepared, is but negligibly more than water, therefore in our calculations for a five per cent. suspension we used 456 grains, or the weight of a fluidounce of water, as the 95 per cent. of vehicle per fluidounce, which calls for twenty-four grains of silver iodide as the five per cent. sought. By ratio, we find that 17.375 grains of silver nitrate are required to yield this silver iodide. A close scrutiny of the figures involved in the chemical reaction reveals the fact that just a little more of silver nitrate is required than of potassium iodide for accurate and complete interchange with each other.

Now the United States Pharmacopœia requires silver nitrate to be practically pure, so no allowance need be made on its part for impurities. But the same authority permits potassium iodide to contain one per cent. of impurities, consisting chiefly of chloride, carbonate and free hydrate, hence some allowance must be made for their most probable presence; and to commensurate for any deficiency of actual iodide, it has been suggested to use a slight increase over the theoretical amount of potassium iodide, and make the quantities of the two chemicals equal. This was invariably done by us, after we had learned by experience that as little as one-fortieth of a grain of unaffected silver nitrate which might remain in solution would very rapidly bring about discoloration of Irish moss mucilage.

There can be but little, if any, objection found to the presence of a minute excess of potassium iodide over that actually required, as it is imperative to completely precipitate the silver so that no soluble salt of it remains in solution, to act either as an undesirable application or as a factor to discolor the emulsion.

For quantities greater than one ounce of five per cent. emulsion, simply multiply 17.375 grains by the number of ounces required.

Silver iodide can, of course, be precipitated, washed, and then suspended in a mucilage, although it requires longer time to get it finely divided by agitation or stirring, and for this reason the plan is not so well suited for hurried calls.

The products of our numerous attempts with this plan were not nearly so uniformly satisfactory as when the silver and potassium salts were dissolved each in one or two fluidrachms of distilled water and each solution diluted with a mucilage to half an ounce before mixing to form the insoluble silver iodide. In other words, the smoothness of the suspension was almost always superior when the reaction was brought about in the presence of a suitable mucilage, and if there is any chemical activity in the preparation, or if it is used solely as a protective application, it must be granted that the more finely divided the silver iodide the greater its efficiency.

When the precipitated silver iodide is not washed before suspending it, the emulsion will, of course, contain the potassium nitrate produced in the reaction, as also any excess of potassium iodide and other soluble salts originally present in the potassium iodide.

The amount of potassium nitrate formed in the preparation of a five per cent. emulsion is 10.34 grains per fluidounce, which equals a 2.27 percentage strength, which is three to four times the strength of the usual physiological or normal salt solutions. When intended for use in the eye, it may be thought necessary to rid the emulsion of soluble salts, although this may not be necessary in all cases, especially when we recall that ten to fifteen grains of borax or other salts are not infrequent ingredients in a fluidounce of eye drops. As a genito-urinary application the presence of these potassium salts is probably of little moment.

But if, for any reason, the emulsion must be free from soluble salts, the silver iodide may be produced from the water solutions of the necessary substances, thoroughly washed with either hot or cold water by decantation, and then incorporated in the suspending medium. Mucilage of Irish moss will serve here either hot or cold. Experience demonstrates that silver iodide settles very rapidly in hot water, and the expectation here would be to see the same thing happen; on the contrary, however, the hot mucilage envelops the silver iodide and overcomes this tendency to settle. Or, as we have found to be thoroughly practical when mucilage of Irish moss was employed, the emulsion may first be prepared by precipitating the silver iodide in the presence of the mucilage and the product then subjected to dialysis, using the ordinary parchment powder papers of the store as the necessary septum.

The former plan, for some reason which we have been unable to discern, unless it be attributed to allotropic conditions of the silver iodide, does not always show as smooth suspensions as would be desired; while the process of dialysis has almost always shown an improvement in this appearance, and has proven a simple expedient in ridding the emulsion of all crystalline matter.

Should it be deemed necessary to sterilize the emulsion either with the salts present or removed, it will be found that the preparation made with Irish moss will withstand this process. A sample subjected to streaming steam for three successive periods of twenty minutes each showed no change except a tendency to thicken slightly on the top surface, and was readily restored by shaking.

When silver nitrate was added to the several mucilages examined some of them showed a tendency to gelatinize, but none of them showed any appreciable precipitate of chlorides, so none were disqualified for such a cause.

Mucilage of sassafras pith, U. S. P., two per cent., failed to suspend the silver iodide, as did also a ten per cent. strength of mucilage. Both products showed stringy coagulations and curds and upon standing and shaking did not improve in miscibility.

Mucilage of flaxseed, twenty per cent., did not serve the purpose nor did one of 100 per cent. strength. The silver iodide went down in veritable lumps which were difficult and sometimes impossible to shake through the liquid.

Mucilage of salep, N. F., one per cent., did not satisfactorily suspend either three or five per cent. of silver iodide, and failed to preserve it; while a five per cent. salep mucilage suspended three per cent. of silver iodide moderately well, but very soon showed a change in color.

Mucilage of elm, U. S. P., six per cent., was not a satisfactory suspending medium by any means; neither was a twenty per cent. strength. This mucilage behaved very much like mucilage of sassafras pith.

Mucilage of quince, N. F., Appendix, of two per cent. strength, and even one of double strength, did not suspend either three or five per cent. of silver iodide. The ten per cent. mucilage yielded variable results, since in some instances it failed outright and discolored, while in others it gave quite satisfactory effects; and one of the most presentable three per cent. emulsions obtained from any experiment we made was afforded by a twenty per cent. mucilage of quince after twelve hours, almost without shaking, although when first made it was a hopeless looking mess of feathery precipitate. We have never been able exactly to duplicate this particular result, which emphasizes the uncertainty of quince mucilage. In the weaker strengths, when the mixtures did not approximate suspension, discoloration was soon observed. When silver nitrate is added to quince mucilage it coagulates it to an almost jelly consistence which requires long stirring to render it sufficiently thin to enable one to proceed with the work. It will therefore be recognized that quince mucilage is very poorly adapted to the purpose.

Mucilage of dextrin, N. F., thirty-three and one-half per cent., suspended the silver iodide, but decomposition began to show almost immediately.

Mucilage of starch, B. P., was prepared by thoroughly cooking starch with boiling water in the proportion of twelve grains to the fluidounce. In this strength of starch mucilage the silver iodide mixed, but quickly settled, leaving a perfectly clear supernatant liquid of about one-third to one-half of the volume. This preparation had the distinction of being the only one from which the emulsified part separated to leave a clear liquid. A mucilage of twenty-four grains to the fluidounce behaved similarly.

Starch showed but very little tendency to discolor, and seems to be suitable so far as appearance of emulsion is concerned, although on several occasions samples of it became mouldy and displayed a musty odor within a week.

Mucilage of acacia, made according to the U. S. P. formula of thirty-four per cent. with thirty-three per cent. of lime water, had a slight acid or nearly neutral reaction. An alkaline mucilage must, of course, be avoided. The slightly acid mucilage of acacia gave good results, as did also a mucilage of the same strength made without lime water and possessing a strong acid reaction to litmus.

Half strength and quarter strength mucilage of acacia also showed good effects. These mucilages contain so much more solids than Irish moss mucilage, however, that they cannot be recommended in its stead.

Mucilage of tragacanth, U. S. P., six per cent., made with or without glycerin, was entirely too viscid, but reduced to one-quarter strength with water it suspended the silver iodide quite satisfactorily, but upon standing for a week or more showed in some samples an inclination to granulate, although some products containing it stood for months without showing much change in color. It can well be considered fit for any emulsions intended for prompt use, although it cannot be prepared as quickly as mucilage of Irish moss and for this reason is not so desirable.

Solutions of gelatin were tested as emulsifying agents only to find that concentrated ones were impractical to use in the presence of silver nitrate because it coagulated the gelatin so intensely; and that solutions which are diluted sufficiently to permit the addition of silver nitrate have very little immediate suspending action on it. For these reasons gelatin was discarded.

Egg albumen in full strength was coagulated so firmly by silver nitrate that it was rejected. Diluted with an equal volume of water it could be put through the process, but the result was a very curdy precipitate and so far from being satisfactory as scarcely to deserve mention along with Irish moss, tragacanth, acacia and starch.

In our original experiments little attention was intended to be given suspending media of animal origin, for the reason that they would putrefy. But after reading Mr. Thum's notes on this subject we decided to repeat our tests with gelatin and egg albumen, and also to try yolk of egg. As reported by Mr. Thum, we also found yolk of egg to be a very efficient and prompt suspending material, but the emulsion began to show a change in color in less than a week.

Compared with the preparation from Irish moss, it cannot be considered in any way superior.

From the foregoing statements it will be observed that some of the mucilages which have been treated of satisfactorily suspend silver iodide but discolor so rapidly as to be impractical, while others among them did not suspend it at all, even when tried in much greater strength than the recognized formula for that particular mucilage.

We have now reached mucilage of Irish moss, N. F., three per cent. It is undoubtedly the best practical emulsifying agent of all examined for the purpose, as every trial and test of it has proven. Its dependability and stability will unquestionably gain for it the commendation of all who try it for this purpose.

But before proceeding to tell the results of the experiments with the mucilage and silver iodide, mention should be made of some of the properties of Irish moss itself which were observed during these experiments. When dried it loses but a trifle in weight, indicating an almost total absence of moisture in its make-up.

The sample we examined and used for these experiments showed a loss of approximately ten per cent. of weight through the washing required to remove all but a faint trace of chlorine; the chlorine so removed represented in terms of sodium chloride six per cent. of the original substance. The water-insoluble substances present in the sample of moss amounted to ten per cent., which indicated a total of eighty per cent. of available water-soluble matter for mucilage.

As hereinbefore stated, it is a remarkable fact that a fluidounce of mucilage of Irish moss made according to the N. F. directions weighs but two and a half to three grains more than a fluidounce of water, making the increase in specific gravity over water practically negligible in all calculations, as it affects but the third decimal place. This fact remains the same whether the mucilage is prepared with hot or cold water. A fluidounce of the mucilage was evaporated in a platinum crucible in order to check up this paradox; the residue weighed less than three grains.

Mucilage of Irish moss is practically neutral to litmus paper, for it shows but the faintest acidity, and a very minute amount of fixed alkali will render several ounces of the mucilage alkaline to litmus and phenolphthalein.

Mucilage prepared by macerating Irish moss in cold water serves in every respect as well as the mucilage prepared with hot water and allowed to cool.

A series of mucilages were made by maceration in cold water for periods of fifteen minutes, thirty minutes, one hour and three hours, respectively, with the result that a fluidounce of the thirty minutes, one hour and three hour samples were on an average within a grain of each other in weight, while the fifteen minute sample was within half a grain of the weight of the thirty minute specimen, demonstrating that thirty minutes maceration with cold water will produce a satisfactory mucilage.

After a number of tests made with the mucilage prepared in strict accordance with the N. F. directions, we finally devised the following plan, basing it on the results of our experiments:

Rejecting brown and harsher portions of the moss, select a few well-bleached and finely curled pieces to obtain the weight required; place these in a graduate and wash with several changes of water; as the texture softens, spread the branches to insure thorough washing; six to eight changes of water within two to three minutes will be found to be sufficient to remove the adhering chlorides. By this time the moss begins to swell and display a gelatinous surface and a test of the washings made now will show but a faint indication of chlorides. There need be no fear of overdoing the washing and thus losing mucilage, for as has been pointed out there will be an abundance of mucilage left to saturate the water. The moss is now macerated in a fresh portion of cold water with frequent stirring for half an hour, then expressed through well-washed muslin used double thick to obtain a clean mucilage. For each fluidounce of five per cent. emulsion to be made, 17.375 grains of silver nitrate are to be dissolved in one fluidrachm of water and this solution mixed with three fluidrachms of mucilage of Irish moss. The same amount of potassium iodide should be dissolved in one fluidrachm of water, and its solution diluted to four fluidrachms with mucilage. The two solutions are now to be mixed by stirring together in order to thoroughly break up any curds of the silver iodide and facilitate suspension. The product may now be transferred to suitable containers.

In carrying out this process, it will be noted that the addition of silver nitrate to mucilage of Irish moss shows but little opalescence; but the silver nitrate causes the mucilage to thicken almost to the point of gelatinization, although it can be stirred into a uniform consistence. On the other hand, the effect of the potassium iodide was to lessen the viscidity of the mucilage of Irish moss.

The entire quantities of the solutions may be mixed at once, or one may be gradually poured or dropped into the other with constant stirring; there appears to be but little difference in behavior, unless it be that, when the entireties are mixed, more time is required to shake or stir into a uniformity of appearance. It seems not to matter which solution is poured into the other, for although silver iodide will dissolve in concentrated solutions of potassium iodide, the solution here employed is entirely too weak even in the beginning and of course is becoming weaker and weaker as the reaction progresses. The emulsions prepared with mucilage of Irish moss present at the time of reaction have seldom, if ever, failed to be smooth and uniform. We have never had a sample prepared in this manner darken or display any decided change in color, but we have had several samples made by first precipitating the silver iodide, washing, and then suspending, begin to darken within a few days.

Emulsions made with Irish moss may be diluted with water or with moss mucilage to make weaker preparations. Dilutions made with water settle more rapidly than those made with mucilage—a natural inference. Suspensions in Irish moss never settled entirely clear, as did starch emulsions. When the precipitate does settle in moss mucilage it appears to be still enveloped by the viscidity of the vehicle and may be easily restored by shaking. A sample prepared last August demonstrates this condition very effectively. It is also possible to make a ten per cent. emulsion with moss mucilage, a sample of which, prepared a few months ago, is here shown (at Association meeting).

Owing to the heavy nature of silver iodide, it is evident that no emulsion should be used without shaking. In all of our experiments flint glass vessels and containers were used, and found to be thoroughly practical, and prolonged contact with cork stoppers has not in the least affected any of the emulsions which were satisfactory when first made, circumstances which compel us to believe that when once formed and protected with mucilage, silver iodide is quite a stable substance; in fact a sample exposed to bright direct sunlight for two days darkened but little, while a specimen unmixed with mucilage of Irish moss had turned drak gray within an hour under the same influence.

Failing in an attempt to filter an emulsion made with Irish moss, it occurred to us to dialyze it as a means of removing the salts in solution, and as a septum we used ordinary parchment powder papers. It required about twenty-four hours and five or six changes of water to extract practically all of the soluble salts. The emulsion was improved in appearance and consistence, through the removal of the crystalline constituents. A comparison was made by allowing a few drops of the original emulsion to spontaneously evaporate upon a smooth glass surface, with the result that the salts in solution were left as a crystalline centre in the residue, while a like performance with an emulsion from which the salts had been dialyzed showed no such crystalline residue, but instead a surface and appearance almost as smooth as a photographic plate.

The potassium nitrate left in the emulsion prevents the mucilage from decomposing, at least so far as odor is evidence. A sample prepared in August, 1915, gives no indication through odor of any change, whereas mucilage of Irish moss alone will within a week to ten days become obnoxious. Likewise, an emulsion from which the salts had been dialyzed developed an odor of putrefaction within a couple of weeks.

While it is evident that emulsion of silver iodide prepared by the method outlined will keep indefinitely, still if there is but an occasional call for it, and no need of keeping it ready made, the plans here and elsewhere given furnish a quick and thoroughly practical method for its production. But no matter which vehicle is used the facility with which silver salts are reduced by certain agents must be remembered so that all utensils used will be scrupulously free from such disturbing causes, for aside from these there is little chance of failure.

Upon comparing mucilage of Irish moss with the other available vehicles, its advantage over tragacanth will be seen to lie in the ease of preparation; while its preference over starch and acacia comes through it introducing so little substance into the preparation.

The advantages of mucilage of Irish moss may then be emphasized as follows:

It can be depended upon as an efficient suspending agent.

It is easily and quickly prepared.

It gives a permanent emulsion.

It supplies a sufficiently viscid medium though adding but a trifle of solid matter.

It is as inert as any other suitable substance.

It is inexpensive.

While yet concerned with this subject a few words will be said regarding the sulphur which is present in Irish moss. To one who had never incinerated a vegetable drug and found a mass of hepar sulphuris as the resulting ash, it was a revelation to encounter such when some unwashed Irish moss was subjected to a bright red heat. With a lower heat very little sulphide is formed, but raised to bright redness, one can see a phosphorescence as of free sulphur burning, although sulphur dioxide could not be detected by odor. The fused mass amounted to 21.25 per cent. of the original weight. Chlorides were present, of course.

Sulphates, earthy phosphates, carbonates, iron, aluminum, and silica were other constituents encountered in the examination of this ash, but no complete analysis was attempted.

A second weighed portion of moss was washed until it began to gelatinize, then dried and ignited. The result showed ten per cent. of ash, and contained abundant alkaline sulphides, and a little chlorides.

A third weighed portion was completely exhausted by repeated applications of boiling water, the residue was dried and weighed. This insoluble part represented ten per cent. of the original substance. It was next incinerated and found to yield 2.5 per cent of ash, calculated on original moss. The ash from this treatment was snow-white; it contained neither chlorides nor sulphides, but consisted of silicious matter. It is worthy of remark that in whatever form the sulphur exists in Irish moss, it has arranged itself in a very accommodating manner, so far as our present use for the mucilage is concerned.

AMERICAN PHARMACEUTICAL ASSOCIATION.

The Atlantic City Meeting, September 5–9, 1916.

By Prof. Edwin L. Newcomb.

The sixty-fourth annual convention of the American Pharmaceutical Association was called to order by the President, Dr. William C. Alpers, at 11.20 o'clock, Tuesday morning, September 5, on the Steel Pier at Atlantic City. The Local Secretary, Mr. Charles Holzhauer, formally greeted the five hundred visiting delegates who were seated in the auditorium and explained the numerous entertainment features which had been provided for the occasion. The excellent facilities for the holding of the general sessions and section meetings were pointed out and the hope expressed that all would profit from the meeting.

President Alpers requested Vice-president LaWall to take the chair while he presented his annual address. President Alpers called attention to the fact that the Association now had twenty branches distributed throughout the United States and that one branch had recently been organized at Havana, Cuba. The availability of the Fairchild scholarship and the provisions which all competing candidates must meet were referred to. In educational matters President Alpers made a strong plea for high school graduation as an entrance requirement to all colleges of pharmacy. The president stated that the educational work which the Association was carrying on was of the utmost importance, and that more publicity should be given to this phase of Association activity. A warning was issued that unless laws are enacted raising the educational qualifications for candidates for pharmacy in different states, states will establish pharmacy courses in their technical high schools, as already has been done in Detroit. The president referred to the Detroit experiment as a dangerous situation. The National Formulary, business methods, finances, and the *A. Ph. A. Journal* were all discussed at length. Many criticisms of the present methods and policies of the A. Ph. A. were made.

At the close of the address, Vice-president LaWall appointed the following committee on president's address: James H. Beal, chairman, M. I. Wilbert, S. C. Henry, L. C. Hopp, and R. A. Lyman, with instructions to report upon the president's address with recommendations at a later session. Following President Alper's address, Dr. Solomon Solis Cohen, Professor of Materia Medica of the Jefferson Medical College, Philadelphia, and a member of the Committee of Revision of the Pharmacopœia, addressed the convention on the revision of drug standards and educational requirements for pharmacists. Dr. Cohen stated that from a medical viewpoint pharmacy, as reflected by the new federal standards, was keeping pace with the other professions. Unfortunately, however, the educational standards of pharmacy had not been advanced in keeping with the progress which had been made in the improvement of pharmaceuticals. He emphasized strongly the importance of a broad educational foundation for the study of pharmacy. He stated that, in his opinion, a high school training was about the proper preliminary educational qualification which a pharmacist should have. He criticized the pharmacist who makes the compounding of prescriptions a side issue.

Immediately after the address by Dr. Cohen Secretary W. B. Day called the roll of states, territories and provinces represented. A recess of ten minutes was then taken in order to allow time for the organization of the nominating committee. The nominating committee met immediately and nominated the following members of the Association to be voted upon by mail during the coming year: President, C. O. Bigelow, C. Holzhauer, H. P. Hynson; vice-president, F. R. Eldred, A. R. L. Dohme, Francis Hemm; second vice-president, L. E. Seltzer, J. C. Wallace, F. P. Haymaker, Philip Asher; third vice-president, Theodore Bradley, Louis Saalbach, G. C. Blakeslee; for members of council, F. J. Wulling, C. B. Jordan, M. I. Wilbert, Otto F. Claus, G. M. Beringer, Albert Bolenbaugh, J. P. Alacan, Thomas F. Main and L. D. Havenhill. At a later session the nominating committee reported that Mr. Bigelow and Mr. Hynson could not be induced to accept the nomination. The following were, therefore, duly nominated for the presidency in their stead: William L. Cliffe and H. C. Christensen.

SECTION MEETINGS WELL ATTENDED.

All of the section meetings throughout the convention were well attended and the discussions were spirited and lengthy. The number of new resolutions adopted was not as great as at some former meetings, but there was every indication that the membership was coming more and more to be in unison on certain fundamental matters which have been discussed for many years.

The proposition to have the Carnegie Foundation investigate the pharmaceutical colleges of the country was discussed in a paper before the Section on Education and Legislation. The failure of the Carnegie Foundation to carry on the work induced the author to suggest that the Association should undertake this work at an early date.

Before this same section a number of papers were presented on narcotic legislation and the consensus of opinion seemed to be that the Harrison Law should be amended so that the recent ruling of the United States Supreme Court that the possession of narcotics by laymen is not evidence of violation of the law would be nullified. Nearly all were of the opinion that the Supreme Court ruling had made the Harrison Law of little value. B. L. Murray, of New York, chairman of the committee on the regulation of the transportation of drugs by mail, presented a valuable report and recommended the approval of a bill now pending in Congress, relieving this situation. The report was well received and would have been unanimously adopted had it not been for the fact that the present form of the bill would prohibit the use of the mails for the transportation of goods containing alcohol, or goods of which alcohol forms a part. Likewise, morphine and its derivatives could not be mailed if the bill passed in its present form.

INCOMPETENT CLERKS.

B. E. Pritchard, of New York, in speaking before the Legislative Section, said: " There are too many stores and too few competent drug clerks." The remedy suggested was that there should be more encouragement given to young men to enter the profession. A good academic education should be required before a candidate is accepted in college. The speaker stated that he had discovered that clerks had come to him who upon examination confessed that they did not understand the language used by the instructors, and that they were deficient wofully in the knowledge of English owing to their limited vocabulary.

A recommendation was adopted calling upon the Treasury Department to give due consideration to an increase of pay to pharmacists in the public health service of the United States. It was pointed out that there had been no salary advances in this particular department for fourteen years.

Professor H. V. Arny, of New York, in presenting his report on weights and measures, called attention to the unusual opportunity at the present time for the extension of our trade in foreign lands. He said that it was necessary that the metric system of weights and measures be adopted at once by manufacturers and wholesalers if anything is to be gained by the present opportunity. The use of the metric system is absolutely essential in handling the South American trade.

PROPRIETARY MEDICINES DEFINED.

Dr. James H. Beal presented the report of the joint committee, representing the N.A.B.P. and the A.Ph.A., concerning the definition for proprietary medicines. The definition which the committee decided upon was the one adopted by the Section on Education and Legislation at the San Francisco meeting last year, reading as follows: A proprietary preparation is any medicine, drug, chemical, or preparation, simple or compound, intended for the cure or prevention of diseases, for man or animal, which is protected by patent or secret formula. The report of the committee was adopted.

The report of the committee on proprietary medicines was of unusual interest in that it gave the results of conferences with proprietary medicine manufacturers of the United States held during the year. The Proprietary Association, it was stated, had adopted practically all of the recommendations concerning proprietary medicines which were approved at the California meeting of the A.Ph.A. The spirit of co-operation which was indicated by the report was highly pleasing to the members of the A.Ph.A., and it was felt that it would go a long way toward the elimination of alcohol and habit-forming drugs when used in patent medicines. Furthermore, it would have a most beneficial effect in the effort to have eliminated statements from patent medicine literature which was deceptive and which in some cases promise cures for recognized incurable diseases. The report received from the Proprietary Association indicated that that organization was as anxious as the A.Ph.A. to eliminate from the proprietary medicine business all features which were in any way detrimental to the public. The publication of formulas of proprietary medicines was discussed briefly and attention was called to the fact that the purchasing public paid very little attention to published formulas. The general consensus of opinion seemed to be to the effect that the publication of formulas would not directly improve conditions.

Many other papers of interest and value were presented before the Section on Education and Legislation. At the closing session of this section, the nominating committee reported the following nominations, who were duly elected to serve for the ensuing year: Chairman, Prof. R. A. Kuever, Iowa City; secretary, C. B. Jordan, Lafayette; associates, A. W. Linton, Seattle; Dr. H. V. Arny, New York; and John Culley, Ogden.

Officers' Reports.

At the second general session reports of the chairman and secretary of the council and also of the secretary and treasurer of the Association were received. High tribute was paid to Professor E. G. Eberle, now of Philadelphia, formerly of Texas and editor of the A.Ph.A. Journal. Professor Eberle was tendered a vote of appreciation by the council and heartily applauded by the general session. The report of Treasurer Whelpley showed a cash balance of $14,000 and trust funds of over $40,000.

Resolutions were adopted directing a vote of thanks to be sent to Sergeant-General Gorgas and Secretary of the Navy Daniels in appreciation of what they have done for pharmacists in their respective branches of the government.

Secretary Day's report was chiefly statistical and showed that a large amount of the membership work of the Association was being carried on by the general secretary.

PROCTER MONUMENT FUND.

Dr. John F. Hancock, of Baltimore, chairman of the William Procter, Jr., Monument committee, presented a report which showed that the increased expenses caused by the necessity for making changes in the design of the monument to meet the approval of the District of Columbia Art Commission were such that the total cost would amount to $8500. The committee now has on hand $1778.15, and nearly $1000 must yet be collected. The bill in Congress, providing a site for the monument and making an appropriation of $2000 for the base, has not thus far been acted upon.

SCIENTIFIC SECTION.

Upwards of forty papers were presented before the Scientific Section, many of which were illustrated by demonstrations consisting of charts, chemical reactions, displays, exhibits and lantern slides. The efforts of the officers of the section to provide facilities for the demonstration of papers were well repaid and the hope expressed that even better facilities for such purposes might be provided for future meetings.

The paper by Professor J. U. Lloyd on "Adsorption," which was fully illustrated by experiments, was highly appreciated by all in attendance. At the closing session of the section, Professor Lloyd was awarded the Ebert Prize for having presented the best paper at the San Francisco meeting.

Dr. H. C. Wood, of Philadelphia, presented a carefully prepared paper on the sum of the results of the Harrison Anti-Narcotic Law. Dr. Wood condemned the readiness with which many physicians resort to the use of narcotics to alleviate pain. Dr. Wood further urged the absolute elimination of narcotics, even in minimum amounts, from all preparations of a proprietary nature. The speaker stated that in his opinion the frequent use of infinitesimal amounts of narcotics was sufficient to produce a habitue. Dr. Wood emphasized the need for caring for narcomania patients, stating that the use of narcotics was a disease and that such patients should not be considered as criminal and then left bereft of any help to meet the conditions imposed. Dr. Wood estimated that there are from one hundred to two hundred thousand victims of the drug habit in the country at the present time. The speaker stated that the number is much less than the total that existed before the enforcement of the Harrison Law. The speaker felt that the solution of the problem of narcotism was to be found in educating the general public to the danger of habit-forming drugs. The consensus of opinion among pharmacists appeared to be, however, that more stringent legislation was needed.

MEDICINAL PLANT CULTIVATION.

W. W. Stockberger, physiologist in charge of drug-plant and poisonous-plant investigations, Bureau of Plant Industry, United States Department of Agriculture, gave an instructive paper illustrated by lantern slides and dealing with the progress which has been made during the past year in drug-plant culture. Dr. Stockberger urged conservatism among those who contemplate going into the commercial production of vegetable drugs. The development of medicinal plant gardens by colleges of pharmacy had the hearty approval of the speaker, who said: " The establishment and proper support of a medicinal plant garden of the pedagogic type as an adjunct to a college of pharmacy or the course in pharmacognosy of a university should be of direct and practical benefit to the students, to the university itself, and finally to the people as a whole."

The large number of other papers presented were nearly all of direct interest to pharmacists. A brief report such as this, however, cannot include abstracts of the papers and do justice to them. The occasion is here taken to point out to retail pharmacists the exceptional value of membership in the A.Ph.A., which includes subscription to the journal of the Association in which the papers presented at the annual conventions are usually published. At the closing session of the Scientific Section, the following officers for the ensuing year were elected: J. L. Turner, Brooklyn, chairman; B. L. Murray, New York, vice-president; and A. W. Linton, Seattle, secretary.

SECTION ON PRACTICAL PHARMACY AND DISPENSING.

Chairman Joseph Weinstein called the first session to order on Wednesday at 2 P.M. The address of the chairman placed emphasis upon the value of clinical examinations by pharmacists as a means of widening the scope of practical pharmacy. Many examples were given to illustrate how the pharmacist could add both to his profits and professional standing by making clinical examinations of urine, sputa, blood tests, etc., for physicians. The address was liberally discussed, during which it was pointed out that work of this kind should bring professional fees which should be paid by the patient as a rule.

J. L. Lascoff presented a paper on uniformity in dispensing and exhibited photographs to show the wide variation in the size of pills compounded in different stores on the same prescription. The paper was of exceptional value to the practising pharmacist, and it was voted that it be referred to the council with the recommendation that it be published in an early issue of the JOURNAL.

Propaganda to have for its purpose more instruction to medical students on the writing of prescriptions for the U.S.P. and N.F. preparations was urged by Dr. Diner, dean of the College of Pharmacy, Fordham University.

M. I. Wilbert, of Washington, presented some valuable suggestions on the scope and possible uses of the proposed A.Ph.A. recipe book. It was the general opinion that the book should contain formulas for cosmetics, toilet articles, household preparations, and similar articles for which the druggist should have a reliable recipe. It was voted to recommend early publication in the JOURNAL of an index of all previously published recipes.

J. S. Levy, of New York, presented a paper entitled: "At Last a Safe Bichloride Tablet." The paper was illustrated by specimens of the new form of tablet which was unusual in shape, being long and slender and containing a small amount of oil of mustard. It was stated that before a person could swallow the tablet he would have his attention arrested by a gustatory shock due to the oil of mustard compounded in the tablet for that very purpose. The length of the tablet, it was stated, was such that it would require considerable time to swallow it in its entirety, and its unusual design was such that it would be virtually impossible for the tablet to be mistaken for some other medicine.

The papers presented before the Section on Practical Pharmacy and Dispensing were unusually well received and, no doubt, will in time be published in various pharmaceutical journals throughout the United States.

SECTION ON COMMERCIAL INTERESTS.

The Section on Commercial Interests held two sessions which by some were considered to be the most interesting of the convention. The effect of the war upon the commercial side of pharmacy and chemistry was dwelt upon at length by R. S. Lehmann, of New York.

The chief feature of the program of this section was the address on "Advertising," by J. Thomas Lyons, of the Baltimore News, Mr. Lyons took up the subject of drug store advertising from the point of view of a layman interested in advertising. He suggested that the appearance of the outside of the store was just as important as the appearance of the interior, and stated that a good coat of paint would be a good investment for many a drug store. He advocated competition in service and in quality rather than competition in prices, and urged all the members to get behind the Stephens price maintenance bill. He finished his address with an earnest plea for co-operation among the retailers.

Several of the papers presented were accompanied by demonstrations of practical methods to use in advertising. At the second session Homer S. Pace delivered a lecture on "Business Education for Pharmacists." This paper brought forth an unusual amount of discussion, during which it was evidenced that the pharmacists of the country differed in opinion as to how much commercial instruction should be given in a college of pharmacy.

Practically all, however, felt that business instruction of some kind should be obtained by the pharmacy student. The percentage of business instruction in proportion to the purely pharmaceutical instruction which the student should acquire may possibly to some extent depend upon the individuality of the student.

SECTION ON HISTORICAL PHARMACY.

The Section on Historical Pharmacy held one session on Friday morning at which time some twenty papers were received, many of which were read in full. The special feature of this session was the presentation to the A.Ph.A. of a life-size picture of Dr. Herman

Hager, dedicated by the New-Yorker Deutscher Apotheker-Verein.

The following officers were elected for this section for the ensuing year: Chairman, W. L. DuBois, New York; secretary, L. E. Sayre, Kansas; and historian, E. G. Eberle, Philadelphia.

THE WOMEN'S SECTION.

Two sessions of the Women's Section were held. At the opening session a vocal solo and a piano recitation were rendered by Miss Margaret Martin; an address of welcome by Mrs. George M. Andrews; and the presidential address by Mrs. G. D. Timmons, of Indiana. Other features of the program in the Women's Section were an address by Professor John Uri Lloyd, and a paper on "Pharmacy as a Vocation for Women," by Mrs. Ray Kenaston, of Bonesteel, South Dakota.

New officers for the Women's Section were elected as follows: Mrs. E. A. Ruddiman, Tennessee, president; Mrs. John F. Hancock, Boston, honorary president; and Mrs. G. D. Timmons, Indiana, chairman of the executive committee.

CLOSING GENERAL SESSION.

At the closing general session held on Friday, the report of the committee on time and place of meeting and the report of the committee on president's address consumed most of the time. The lengthy discussion of something over one hour resulted in Indianapolis being chosen as the next meeting place, the exact time to be set by the council. The report of the committee on president's address, while comprehensive was not conclusive, as the president's address was very lengthy and contained many details upon which the committee could not agree. The committee recommended that their report, which provided for a continuation of the committee, be received. After considerable discussion, which at times grew almost acrimonious, the recommendation of the committee was adopted.

A recommendation referred by the Section on Education and Legislation was presented for adoption in the general session. The recommendation requested the appointment of a committee of three to work with the voluntary conference for the purpose of completing the A.Ph.A. model pharmacy laws. Recommendation duly adopted.

The final report of the committee on membership showed that there had been four hundred and forty-eight new members elected, which was stated to be the highest number elected during any one year in the history of the Association.

Resolutions of thanks to the local secretary and his associates, the New York and Philadelphia branches, and the New Jersey Pharmaceutical Association, and also to the hotel management were adopted. The formality of installing officers was dispensed with on account of the absence of Dean F. J. Wulling, of Minnesota, the new president. No other business being offered, the convention adjourned.

AMERICAN CONFERENCE OF PHARMACEUTICAL FACULTIES.

SEVENTEENTH ANNUAL CONVENTION.

Philadelphia, September 1–2, 1916.

The seventeenth annual meeting of the American Conference of Pharmaceutical Faculties was held in Philadelphia, September 1 and 2. The sessions were largely taken up by the reports from the sixteen committees which were appointed as a result of the address of President F. J. Wulling one year ago.

President H. V. Arny presided and presented a very able address containing many recommendations, the following of which were adopted:

1. That committee number 3 be continued and that the committee be requested to investigate pharmacy courses in high schools and report at the next meeting of the conference.
2. That two years of high school work be recommended to all colleges as an entrance requirement in 1917.
3. That a joint committee from conference and boards shall endeavor to secure the co-operation of the legislative committee of each state pharmaceutical association in arranging for a referendum vote on prerequisite legislation, to be participated in by all of the registered pharmacists of the state in question (approved at joint meeting of Conference and Boards).
4. Providing for a continuation of the sixteen special committees for the coming year and directing the executive committee to consider the advisability of retaining some as standing committees.

The Syllabus Committee reported that plans were being made to issue a third edition of the syllabus in 1919, to become effective in 1920. Eventually they hope to revise only every ten years.

It was voted that two classes of memberships in the conference be not recognized at this time. The majority of members seemed to feel that such a procedure would not give as much encouragement to short course schools as the present method.

The Committee on Higher Educational Standards recommended that inasmuch as the N.A.B.P. at their 1915 meeting recommended that in 1920 boards of pharmacy should require four years of high school training preparatory to the taking of an examination, they felt that it is now time for the conference to take action making the four years high school requirement binding for all institutions holding membership in the conference with the beginning of the academic year 1920–21.

The Committee on Alumni Activities reported that the colleges through some faculty member or members can greatly stimulate alumni activity. The alumni should be cultivated in order to afford the reciprocal advantage of continuing faculty interest and influence upon former students and also to create and maintain the help and co-operation of the alumni for the college. They recommended that their report be sent to the secretary of the alumni association of each college with the request that same be given thoughtful consideration.

The Committee on Curriculum reported that the curriculum should be divided into three main departments, but that pharmacy should have slightly more than one-third of the work. The following percentage values were suggested: chemistry, 30 per cent.; materia medica, 30 per cent.; pharmacy, 40 per cent.

Business and law sub-courses are very proper parts of the curriculum.

Book research courses of reading and the cultivation of medicinal plants are valuable lines of work and credit should be allowed.

The Committee on College Bulletins offered the following recommendation, which was adopted: That each college publish in tabular form in their bulletin their curriculum, stating the number of hours credit each course carries and a special number for each course; that a statement be given showing the number of lectures and quiz periods and hours devoted to laboratory work in each course.

The Committee on Questions and Examinations offered five recommendations, which were adopted. The recommendations were as follows;

1. *Resolved,* That the work of the Committee on Questions and Examinations be continued; and that five sections of the Conference be authorized in order to effectively carry on the work.

2. *Resolved,* That the Secretary of the Conference notify the Faculty members of each School or College of Pharmacy of this action and ascertain in which section or sections the teachers wish to be enrolled and will serve.

3. *Resolved,* That the sub-sections shall be designated by the titles as indicated in the report, or in some form acceptable to the members, and that membership in each sub-section shall consist of at least one Faculty member from each School who is teaching the subject or subjects covered by the section to which he or she may belong.

4. *Furthermore,* Since the work of these respective sub-sections is intended for the benefit of the Board Examiners as well as for the teachers, therefore, be it further *Resolved,* That the members of the Boards of Pharmacy be informed of the action of Pharmaceutical Faculties and be invited to co-operate, and that the Board members examining candidates in subjects under the several sub-sections be requested to collaborate with the membership of such sub-sections and be kept informed of the progress of the particular work in which they may be interested.

5. *Resolved,* That each sub-section through its Chairman shall present an annual report of its work and that one session each year shall be devoted to the reading and discussion of the sub-section reports.

The report of the Committee on Prerequisite Arguments was presented and the following is a summary of the same:

1. Prerequisite legislation has had a fair test. It has been in operation in New York for eleven years. During this period four other states have adopted it by law and two by state board regulations. No serious efforts have been made to repeal these laws or regulations. The results have been satisfactory to the pharmacists of these states. There has been no shortage of clerks nor have clerks' wages been unduly advanced. Entrance requirements to the colleges have been increased with the result that a better educated class of young men are entering pharmacy.

2. Public welfare demands that the pharmacist be well trained. This training is not unduly expensive. Ambitious and energetic young men may be self-supporting, or nearly so, while attending

the schools of pharmacy. Quiz courses and courses by mail do not give the right training. Self-trained men are unlikely to be well trained.

3. The present and future welfare of pharmacy demand better preparation, both preliminary and professional, on the part of the young men entering its ranks. The underlying sciences and the related medical branches are developing rapidly: pharmacy must keep up or lose caste altogether.

4. Prerequisite legislation is coming. It is better that pharmacists should direct it and adjust it to their conditions rather than to have it framed by outsiders. Properly drawn prerequisite laws will work no hardship on anyone.

The Committee made the following recommendations:

The slow progress of prerequisite legislation in some of the states is due to the indifference and the lack of information on the part of druggists rather than to any feeling of hostility. In correspondence with state association secretaries a common expression is: " The prerequisite is coming but the time is not yet ripe for it." Druggists must be informed regarding prerequisite education and what it aims to accomplish. They must be frequently reminded of its bearing upon pharmaceutical progress. In short, they must be educated to an appreciation of its importance. Publicity must be sought not only through the pharmaceutical journals but also in the medical journals and in the newspapers.

As a first step in the education of druggists the legislative committee of this joint body should get into communication with the legislative committees of the state associations and should supply them with copies of this report or of such parts of it as may seem desirable. The request might be made that when the state legislature committee reports to its state association, a copy of this report be included.

A joint committee of the National Association of Boards of Pharmacy and the American Conference of Pharmaceutical Faculties should be appointed, with instructions to secure as much publicity as possible for the prerequisite movement.

The support of physicians individually, as well as of the state medical societies, should be sought. As a rule, physicians are quick to appreciate the importance of professional training based on adequate high school preparation.

A motion prevailed that the prerequisite arguments as presented by this committee be published in the *A.Ph.A. Journal* at an early date and that reprints be supplied to members of the Conference, Boards of Pharmacy and the journals.

New Officers.—The officers of the American Conference of Pharmaceutical Faculties elected for the coming year are as follows: President, Dr. R. A. Lyman, University of Nebraska, Lincoln, Neb.; vice-president, Dean T. J. Bradley, Massachusetts College of Pharmacy, Boston, Mass.; secretary and treasurer, Dean Wilbur J. Teeters, University of Iowa, Iowa City, Ia.; executive committee: J. A. Koch, Pittsburgh, H. V. Arny, New York, W. B. Day, Chicago; syllabus committee, C. M. Snow, Chicago.

THIRTEENTH ANNUAL CONVENTION OF THE NATIONAL ASSOCIATION BOARDS OF PHARMACY.

By Prof. E. L. Newcomb.

The thirteenth annual convention of the National Association Boards of Pharmacy was called to order at 10.45 on Thursday morning, August 31, in the Assembly Room of the Bourse, Philadelphia, by the president, J. C. Burton, of Stroud, Oklahoma.

W. L. Cliffe, of the local committee, extended a hearty welcome to the visiting members, which was responded to by John Culley, of Utah.

President Burton called on Secretary H. C. Christensen, of Illinois, to call the roll. After the roll the secretary announced that twenty-eight states were represented.

John A. Weeks, of Texas, addressed the Association on the subject, "The Responsibility of Pharmacy Boards." Mr. Weeks said in part, "The member of a board of pharmacy is in a measure responsible to every patient and every physician in his state for the work done by the licentiates of his Board. The judge on the bench into whose hands is thrust the power of passing the death sentence is a no graver or more responsible dispenser of justice than the man who passes on the fitness and qualifications of those who are to compound remedial agents for the sick. The examination of a candidate to practice pharmacy should be conducted without fear or favor and each candidate should be given the grade he earns.

"A very grave responsibility confronts us when we realize that

American pharmacy can never be stronger, better or more efficient than its state examining boards. When you place an O. K. on an unqualified man or woman you have perpetuated a wrong that can never be righted. The status of American pharmacy is established by the state boards. Neither the pharmacists nor the schools can establish the standards, since the state board is the gateway through which the pharmacist must enter the craft. I do not believe all boards are as careful as they should be, either in the preparation of the questions or in the grading of papers. I do not believe we take the position as seriously as we should or appreciate our responsibilities to the fullest extent."

Mr. Weeks urged that a standard of preliminary education be required of all those who seek to practice pharmacy, and that examinations be standardized, so that " registered pharmacists " will mean the same thing in every state.

The address was discussed by Messrs. Meridith, Diekman, Christensen, Diner, Osterlund, Leverty and others.

At the suggestion of J. A. Leverty, the subject " Identification of Applicants for Reciprocal Exchange " was discussed, with the result that a committee was appointed by the Chair to draft a plan of identification. H. L. Meredith, Maryland; H. L. Haussaman, North Dakota; and J. T. Baltar, Louisiana, constituted the committee.

This committee's report, which was presented by H. L. Haussaman, recommended a blank similar to a Traveler's Check to be signed by the applicant and attested by three citizens of the city in which the applicant resides; one of the witnesses shall be a former employer of the applicant or a registered pharmacist. The report of the committee was adopted.

At the opening of the afternoon session, on motion of H. C. Christensen, the application of the Mississippi Board of Pharmacy for *active* membership and the application of the New Jersey Board for *associate* membership were accepted.

President Burton at this point requested J. W. Gayle, of Kentucky, vice-president, to take the chair, and then proceeded with the "President's Address." Recommendations were as follows: First, that a committee of at least five be appointed from this body to present to the Section on Education and Legislation of the American Pharmaceutical Association such provisions as may be adopted by this Association; and, further, to co-operate in joint session with that Section, with a view to obtaining the adoption of a number of "provisions" on matters of general interest to pharmacy that may be furnished to state board or state association members who may ask for suggestions regarding desirable changes in state pharmacy laws.

Recommendation No. 2: The same committee to submit resolutions of interest that may be passed by the N.A.B.P., to the A.Ph.A. for its endorsement.

Recommendation No. 3: Appointment of a committee on "Higher Educational Standards" to work with a similar committee from the A.Ph.A. and N.A.R.D.

Recommendation No. 4: Appointment of a committee of three on "Relations of Colleges with Boards," to work with a similar committee from the Faculties.

Recommendation No. 5: That the joint committee of the Faculties and Boards on "More Satisfactory Examination of Candidates for Graduation and Candidates for Board Certificates," be continued.

Recommendation No. 6: Be it hereby resolved that we request the Section on "Education and Legislation" of the A.Ph.A., in joint session with the Faculties and Boards, to give consideration to a "Prerequisite Provision" (graduation from school of pharmacy clause), that when enacted in a state pharmacy law will not be retroactive in its application, thereby preventing the Board of Pharmacy of such a state from granting reciprocal registration (both states being "active" member states of the N.A.B.P.) to applicants who are not graduates of schools of pharmacy but who at the time of passing examination and becoming registered in their state, complied with all the requirements of the laws of the state pertaining to registration of pharmacists, such laws having equal requirements at the time with the state in which the applicant may later seek to gain reciprocal registration.

On motion of H. L. Meredith, Chairman Gayle appointed W. H. Cousins, Texas; H. A. Eaton, Iowa; and D. R. Millard, Maryland, as a committee on the president's address. The committee later reported favorably on all recommendations made by the President, and on vote of the Convention they were adopted.

On resuming the Chair, President Burton called on George M. Beringer, Jr., of the New Jersey Board of Pharmacy. (This Board was elected to "associate membership" at the morning session.) Mr. Beringer stated that although the New Jersey Board had only just become affiliated with the Association, they had always taken an active part in furthering the best interests of pharmacy and had for some time been alive to the good work being done by the Association, and were glad to be placed in a position to give greater assistance in bringing about continued progress.

Chairman Lawrence C. Lewis of the Executive Committee presented the report for his committee, which was referred to a committee consisting of the following named members: W. E. Sherriff, Kansas; Leo L. Mrazek, Illinois; H. E. Purdy, Connecticut. The committee later reported favorably on the following recommendations, which were then adopted by the Association:

Recommended that annual meetings of the N.A.B.P. be held at the same place as the A.Ph.A. conventions, on Monday and Tuesday of the same week in which the A.Ph.A. convention is held, Provided, however, that the program of sessions of the N.A.B.P., the A.Ph.A. and the joint sessions of the Faculties and Boards be arranged so that the most important sessions of these bodies will not conflict with each other. Otherwise, it is as suggested that it might become necessary to recommend that the N.A.B.P. and the A.C.P.F. hold their meetings either just preceding or just after the A.Ph.A. Convention. It was also suggested that unless the A.Ph.A. Conventions would be held in locations favorable to the largest possible attendance, it might become necessary for the Boards to hold their annual meetings separately from those of the A.Ph.A.

Recommended that the Secretary attend board of pharmacy examination meetings in the various states whenever possible, with a view of bringing about compliance with recommendations of the Advisory Examination Committee (of which Secretary Christensen is chairman) with regard to more uniformity of examinations in the different states.

Recommended that changes in the new United States Pharmacopœia be not taken into consideration in preparing boards of pharmacy examination questions until after January 1, 1917, and that for the first year after that date only such changes as apply to the more potent drugs and their preparations be given consideration.

Recommended that state boards follow as closely as possible suggestions of the Advisory Examination Committee of the N.A.B.P. with regard to examination questions and methods.

Recommended that members of boards of pharmacy meet with those of adjoining states during examination periods whenever possible.

(*To be continued*)

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NOVEMBER, 1916

A NEW METHOD FOR THE DETERMINATION OF VANILLIN IN VANILLA EXTRACT.

By Arthur W. Dox and G. P. Plaisance.

(Chemistry Section, Iowa Agricultural Experiment Station.)

The official method for the determination of vanillin in vanilla extract consists essentially in removing the alcohol, extracting the vanillin with ether, crystallizing it from the ethereal solution and weighing it directly, identifying the crystals if necessary by their melting point. This method was first proposed by Hess and Prescott.[1]

Modifications were subsequently introduced by Winton and Silverman,[2] and by Winton and Bailey.[3]

For details of manipulation reference should be made to the official methods of the A.O.A.C.[4]

The whole operation is rather lengthy and tedious.

Methods dependent upon the precipitation of vanillin by various reagents have been suggested but have not come into common use. Hanus[5] used m-nitrobenzoylhydrazide as a precipitant, and also platinic chloride[6] for estimating vanillin in the presence of piperonal. Moulin[7] converted the vanillin into a yellow methyl picrate and estimated it colorimetrically. More recently Folin and Denis[8] have devised a colorimetric method based upon the color obtained by means of phosphotungstic and phosphomolybdic acids.

The writers[9] have found that thiobarbituric acid in the presence of 12 per cent. hydrochloric acid is a general reagent for the precipitation of aromatic aldehydes and have applied it to the quantitative determination of furfural.[10] Under these conditions vanillin gave with thiobarbituric acid an insoluble vermilion colored precipitate, which analysis showed to contain the percentages of nitrogen and sulfur required for the simple condensation product, 3-methoxy-4-hydroxybenzalmalonylthiourea. Since the reaction appeared to be practically quantitative, we decided to test out its possible application as a means of quantitatively estimating vanillin.

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[1] J. Am. Chem. Soc. 21, 256 and 719 (1899).

[2] *Ibid* 24, 1128 (1902).

[3] *Ibid* 27, 719 (1905).

[4] Bur. Chem. Bull. No. 152, p. 146.

[5] Zeitschr. Untes. Nahr. Genussm 10, 585 (1905).

[6] *Ibid* 10, 657 (1900).

[7] Bull. Soc. Chem. 29, 278 (1903).

[8] J. Ind. Eng. Chem. 4, 670 (1912).

[9] Dox and Plaisance, J. Am. Chem. Soc. 38, 2164 (1916).

The first experiments were conducted with a standard solution of pure vanillin. Aliquots of this solution were precipitated with thiobarbituric acid in the presence of 12 per cent. hydrochloric acid. The total volume of the reaction mixture was 50 c.c. The precipitates were allowed to stand over night, then filtered on Gooch crucibles, washed with 50 c.c. 12 per cent. hydrochloric acid in small portions and finally with 20 c.c. of water. The results are set forth in the following table.

Vanillin taken g.	Wt. of precipitate g.	Vanillin recovered	Error mg.
.0200	.0330	.0180	−2.0
.0200	.0337	.0184	−1.6
.0200	.0336	.0184	−1.6
.0200	.0330	.0180	−2.0
.0500	.0877	.0480	−2.0
.0500	.0890	.0487	−1.3
.0500	.0885	.0484	−1.6
.0500	.0890	.0487	−1.3
.0500	.0888	.0486	−1.4
.0500	.0906	.0495	−0.5
.0500	.0900	.0492	−0.8
.0500+	.0890	.0487	−1.3
.0500+	.0890	.0487	−1.3

+Clarified with lead acetate.

In each case the filtrate was a lemon-yellow color, indicating that a small amount of the condensation product remained in solution. This observation is further substantiated by the fact that the vanillin recovered is somewhat less than the amount taken. The error is, however, quite uniform, regardless of the amount of vanillin taken, averaging 2.6 mg. of the condensation product or 1.4 mg. vanillin. It is apparent therefore that a solubility correction must be applied just as in the determination of furfural by the official phloroglucinol method.

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[10] Dox and Plaisance, *ibid* 38, 2156 (1916).

Before applying the method to the determination of vanillin in commercial vanilla extracts, where clarification is necessary, the use of lead acetate as a clarifying agent was tested. In the last two determinations in the above table, lead acetate was added and the excess removed from the filtrate by hydrochloric acid before adding thiobarbituric acid. The results are in close agreement with the other results, showing that the small amount of lead chloride remaining in solution does not interfere with the determination.

A sample of vanilla extract of known purity was next used. The procedure was as follows:—25 c.c. of the extract were dealcoholized in the usual manner, then transferred to a 50 c.c. standard sugar flask and filled to the mark with lead acetate solution. After standing for several hours at about 37° C. the contents of the flask were filtered through a dry filter. The filtrate was a straw color, indicating the absence of caramel as added coloring matter. 40 c.c. of this filtrate was then transferred to another 50 c.c. flask. Sufficient concentrated hydrochloric acid was added to bring the volume to 50 c.c. and the acidity to 12 per cent. After standing a few minutes the lead chloride was removed by filtration through a dry filter and 40 c.c. of the filtrate taken for the determination. On adding thiobarbituric acid in 12 per cent. hydrochloric acid solution, an orange colored precipitate resulted, indistinguishable in color from the product with pure vanillin. However, the color of the filtrate was somewhat darker than with vanillin alone, due no doubt to the original color of the filtrate after clarification. The precipitate was allowed to stand over night filtered on a Gooch crucible, washed with hydrochloric acid and water as in the previous determination and dried at 98°. The results were as follows:—

Vanilla extract taken c.c.	Aliquot % of extract taken	Wt. of precipitate g.	Wt. of precipitate corrected for solubility	Vanillin found in aliquot	Vanillin in 25c.c. extract g.	Vanillin in extract %
25	64	.0450	.0476	.0260	.0406	0.16
25	64	.0450	.0476	.0260	.0406	0.16
25	72	.0501	.0527	.0288	.0400	0.16
25	72	.0498	.0523	.0286	.0397	0.16
25	72	.0510	.0536	.0293	.0407	0.16
25	72	.0501	.0527	.0288	.0400	0.16
25	72	.0502	.0528	.0289	.0401	0.16
25+	80	.0890	.0916	.0501	.0626	0.25
25+	80	.0882	.0908	.0496	.0621	0.25

+ Not clarified.

The above method is not applicable to artificial extracts where caramel is added as a coloring matter, since caramel contains furfural derivatives which react with thiobarbituric acid. The absence of caramel should first be demonstrated qualitatively. When caramel is present, the filtrate after clarification is brown instead of straw-colored. A still more delicate test, described here for the first time, is the reaction with phloroglucinol. After clarifying and removing the excess of lead as chloride, phloroglucinol is added. In the presence of caramel a brown precipitate is formed. If caramel is absent, the vanillin gives a delicate rose pink color or a slight pink precipitate. Clarification of the sample is necessary, as shown by the fact that the two determinations without clarification gave high results.

SUMMARY.

Thiobarbituric acid, which is easily prepared from malonic ester and thiourea, may be used for the quantitative determination of vanillin in vanilla extracts which do not contain caramel as added coloring matter. When caramel is present it may easily be detected by the brown precipitate formed on the addition of phloroglucinol to the clarified extract containing 12 per cent. hydrochloric acid.

A METHOD FOR THE DETERMINATION OF SALOL AND ACETANILID IN A MIXTURE OF THE TWO, AND OF SALOL AND ACETPHENETIDIN IN THEIR MIXTURES.

By Benedict Salkover, B.Ch.E.

A method for the quantitative determination of both salol and of acetanilid in a mixture of the two, and of salol and acetphenetidin in their mixtures, whether occurring in tablet or powder form, is essential to the pharmaceutical chemist. The various chemical methods which have been proposed are long-involved, time-consuming, and contradictory. The length of time consumed in the painstaking performance of these processes is more than the commercial chemist has at his disposal.

A very simple and efficient method for the foregoing analytical determinations has been devised and practised with consistent success in this laboratory. This method depends upon the fact that while salol, acetphenetidin, and acetanilid are very soluble in chloroform, salol only is easily soluble in petroleum-ether, experiments conducted by us showing that 100 c.c. of petroleum-ether dissolves only 0.015 gm. acetphenetidin and 0.022 gm. acetanilid. The exact procedure of the steps in the process is as follows:

A weighed quantity of the mixture to be analyzed (if this occurs in tablet form a suitable number of the tablets are crushed in a mortar to a fine powder) is brushed into a bottle, covered with a measured quantity of chloroform, and shaken for about one-half hour. An aliquot part of the chloroform extract is filtered into a tared Erlenmeyer, the chloroform is volatilized on a steam- or water-bath, a spray trap being used to prevent loss of the substance to be determined, and the residue is dried at 60° C. to constant weight. By this means the amounts of salol and acetanilid, or of salol and acetphenetidin, present in the mixture can be determined.

Another weighed amount of the mixture is brushed into a bottle, and, in order to determine the salol present, a convenient volume of petroleum-ether (boiling at 40° to 45° C.) is added, and the bottle is shaken for about one-half hour. An aliquot part of the petroleum-ether extract is filtered into a tared Erlenmeyer and is evaporated upon a steam- or water-bath, a spray trap here also being used. The oily salol residue is dried at 50° C. to constant weight. By subtracting the correction for the solubility of acetanilid or of acetphenetidin in petroleum-ether, depending upon which occurs in the mixture, the salol content is determined. The amount of acetanilid or of acetphenetidin present can be determined by difference.

Experiments have been carried on in this laboratory which have proved that the presence of materials usually occurring in tablets, viz., talc, starch, acacia, tragacanth, etc., has no effect whatever upon the accuracy of the method.

Laboratory of the Wm. S. Merrell Chemical Company,
Cincinnati, Ohio.

THE VASCULAR ANATOMY OF PIPER METHYSTICUM.[1]

CONTRIBUTIONS FROM THE HULL BOTANICAL LABORATORY 218.

By Rachel E. Hoffstadt.
(With Twenty-three Figures.)

Historical.

Linnæus placed the Piperáce in the monocotyledons among the Aroidaceæ; Jussieu held that they were near the Urticaceæ; Kunth[3] and Blume ranked them with the monocotyledons. De Candolle,[4] however, following Jussieu, stated that the embryo characters indicated their dicotyledonous character, Engler and Prantl[5] put the tribe Piperales among the lower Archichlamydeæ. Included in it are 4 families: Saururaceæ, Piperaceæ, Chloranthaceæ, and Lacistemaceæ. The genus *Piper* contains over 1000 species. Miquel[10] separates 7 species from the original classification on the basis of the presence or absence of his so-called "stipula oppositifolia" and persistence of the petiole. Among these is *Piper methysticum* Forst., which he calls *Macropiper methysticum.* Engler and Prantl,[5] using as a basis of their classification of these two genera the method of branching in the floral regions, retain the name of Forster.

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[1] Reprinted from *The Botanical Gazette*, lxii, 1916, pp. 115–132.

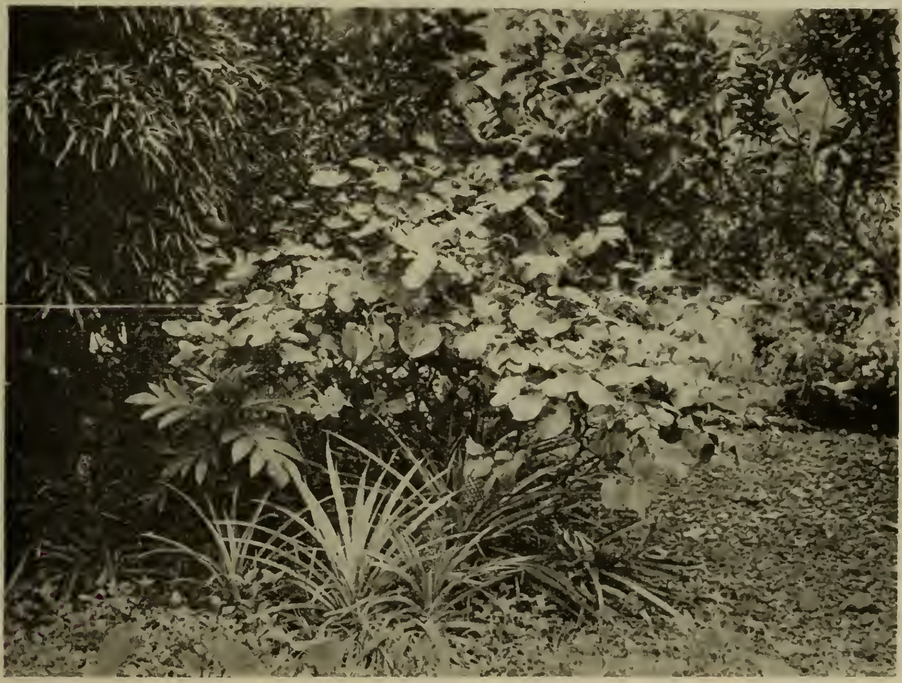
Piperaceæ have attracted much attention because of their anomalies, both in anatomical and reproductive features. The former have been described in many species. Miquel[10] asserted that the internode of the stem ends blindly in the petiole, and the next internode develops from a bud between the petiole and the end of the foregoing node. He stated also that there are alternate, opposite, and whorled leaves on the same branch. The latter he concluded were atrophies, and the number of internodes which would have been produced would have been the same number as the whorls of leaves. Sanio[11] described in detail the structure and the course of the bundles in the stem of *Peperomia blanda.* Schmitz[12] verified the work of Sanio in *Peperomia.* He concluded that the peripheral bundles in *Piper* were joined at their base with the inner bundles of the stem. The small bundles of the leaf trace come from branches of the peripheral bundles. They, as well as the central bundles, go with or without branching into the petiole, which is merely a continuation of the stem.

In an elaborate discussion of the vascular anatomy of the Piperaceæ, Weiss[19] deals with 11 species of *Peperomia* and 8 of *Piper,* and draws the conclusion that in the Piperaceæ there is a transition from the monocotyledonous to the dicotyledonous type of bundle.

By far the most detailed account is that of De Bray.[3] He used 4 species of Saururaceæ, 16 species of *Piper,* 3 species of *Artanthe,* and 11 species of *Peperomia.* In *Piper* he found 2–4 rings of bundles arranged in two systems, the peripheral and the pith systems. The peripheral bundles are of two sizes; the outer ring is completed by an interfascicular cambium; the leaf trace comes from a peripheral ring, which in the node below is a branch of the central bundles; the vascular supply of the axillary buds is from both peripheral and central bundles. He compares the families of the group, but shows no relationships.

In Van Tieghem's [17] work on the mucilage canals of *Piper* he describes in detail the stem of *Piper nigrum.* He found that there are two circles of bundles; that the pericycle becomes lignified late in the growth of the stem; that the cambium for a long time cuts off segments only on the side toward the pith, and may cut off very late a few segments on the other side; that the mucilage canals vary in location with different forms and are not continuous through the nodes; and that the canal of the petiole is not continuous with that of the branch.

Fig. 1.



Piper Methysticum growing in Samoa.

The present study of *Piper methysticum* was taken up with the idea of giving a modern interpretation to the vascular structure, and to ascertain whether the stem keeps pace with the gametophyte of the group.

Material.

I am indebted to Dr. W. J. G. Land for the material for this study. It was collected on the Island of Tutuila, Samoa (Fig. 1). The plant is a native of the South Sea Islands, and is commonly called *Ava* or *Kava,* the natives extracting from its roots the national beverage bearing that name.

It becomes a shrub 1–1.5 m. in height and is propagated mostly by cuttings. No seedlings were obtainable. The leaves are ovate, 18–25 cm. in diameter, with a deep cordate base and a short accuminate apex. The blade is bright green, smooth above, and bears fine multicellular hairs on the veins beneath. It is distinctly petioled, the petiole having a sheathing base and a deciduous stipule. The leaves are alternate and the dense flower clusters are borne opposite them. The internodes are 7–10 cm. long, the nodes being swollen, smooth, and in the older ones irregularly spotted. Both old and young stems have an herbaceous appearance. The largest nodes examined were 2.75 cm. in diameter, and the smallest were 2 mm.

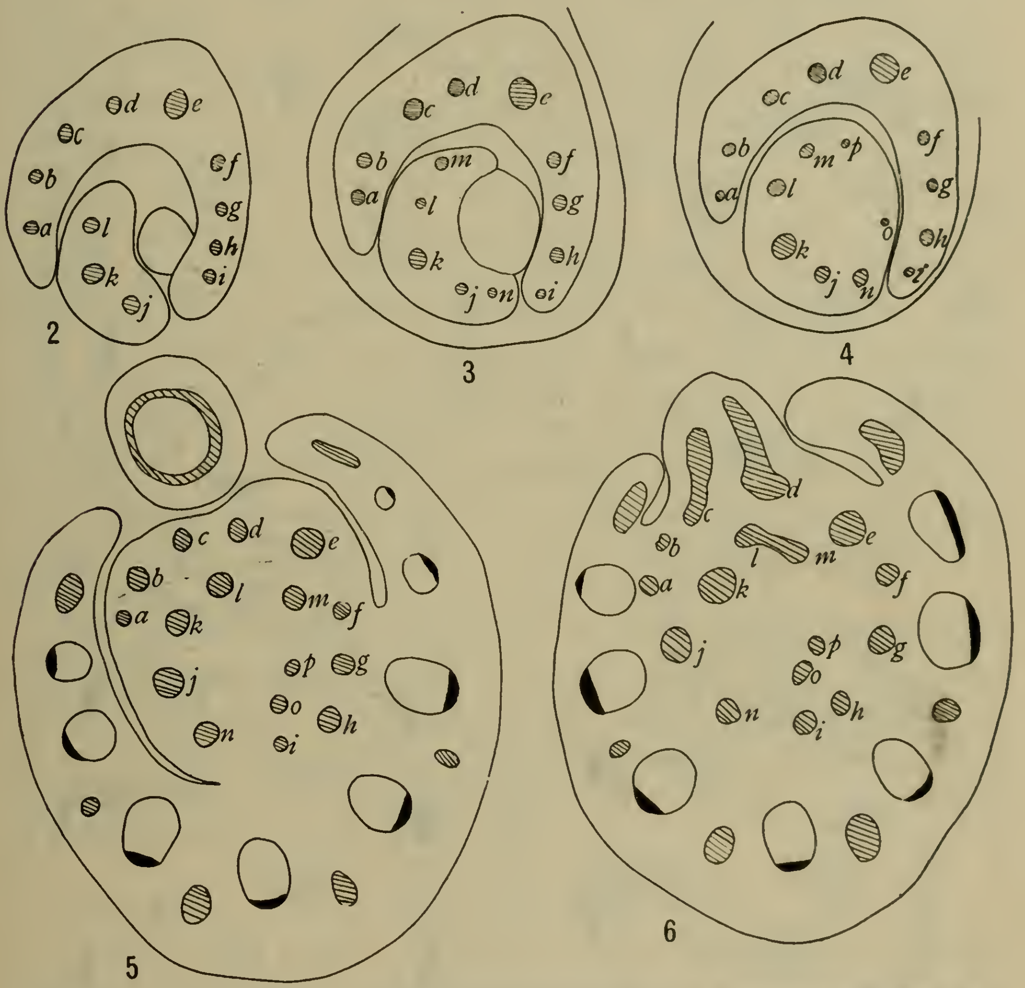
For the sake of comparison *Piper umbellatum* (*Heckeria umbellata* Kunth) was used, the material being obtained from plants brought from Mexico. In shape and size the leaves resemble those of *Piper methysticum.* The petiole has a sheathing base; the nodes are swollen and marked with several distinct rows of spots; the internodes are 5–9 cm. long and when young are covered with dense rows of hairs, giving a ridged appearance; the older internodes are smooth but spotted.

The younger stems and nodes were cut in paraffin at 25–30 μ and complete series obtained. The largest stems and nodes were treated with hydrofluoric acid for one week and then sectioned at 30–50 μ with a sliding microtome, in this case also the series being complete. The safranin Lichtgrün stain was used.

ORIGIN AND COURSE OF STEM BUNDLES.

The stem of *Piper methysticum* contains at maturity three rings of bundles, one peripheral and two within the pith, the bundles being foliar. The terminal bud is enveloped in the sheathing base of the youngest leaf. In some cases a bud was found within the sheath of a single leaf with as many as 3 leaves, each of which was inclosed in the base of the petiole just beneath it.

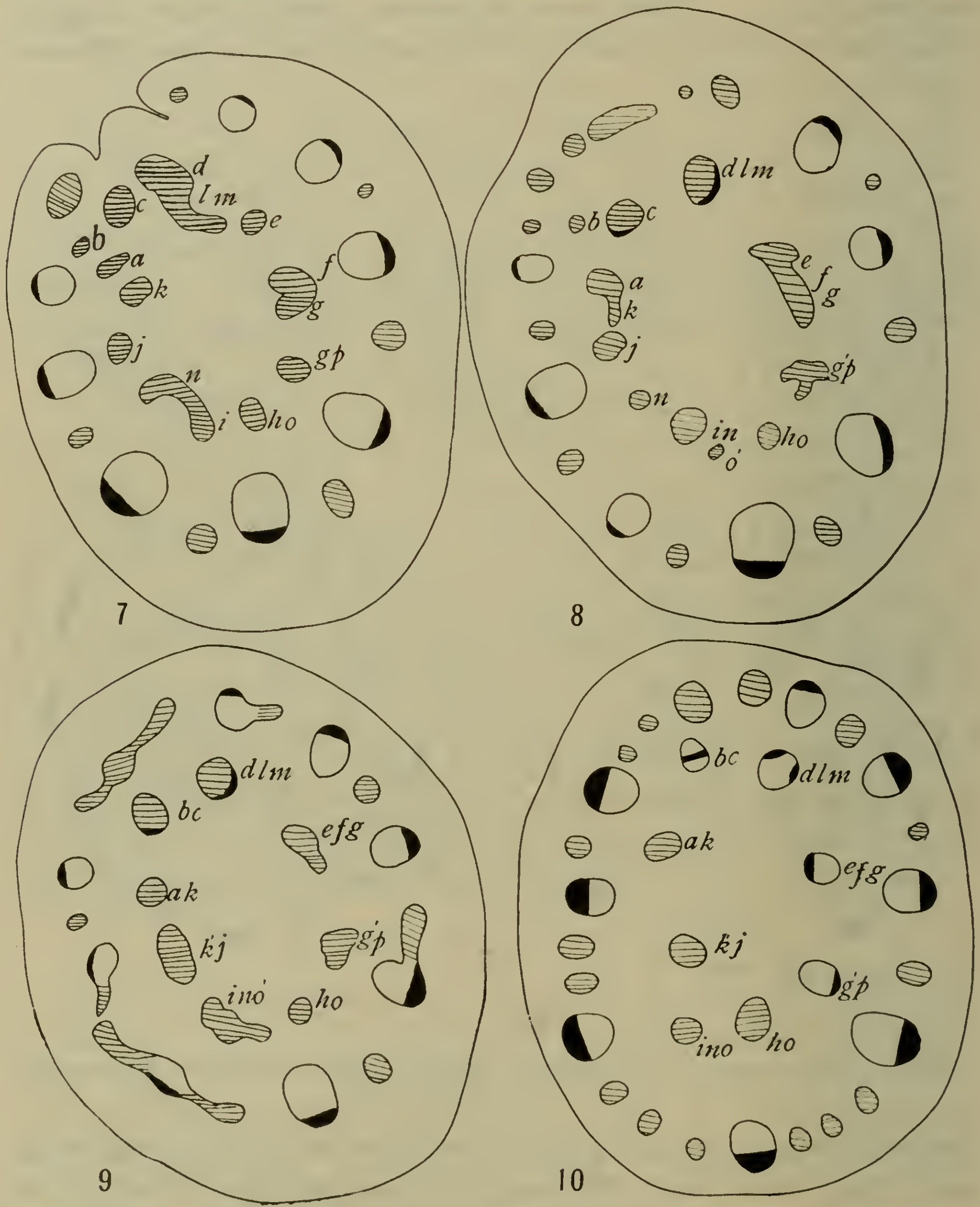
The leaf primordium appears on the stem tip early and forms about it a semicircle, and 5–7 procambial strands are soon differentiated. These connect with the first strands of the stem (Figs. 2–4, *j–p*). Strands *j–p* are the strands of the youngest leaf (node 1); *k* is the first to be differentiated; *j* and *l* follow quickly; *o* and *p* come last. The bundles of the second leaf (node 2) are represented by the series *a–i*. At node 1 the stem contains a single row of scattered bundles. These bundles (*j–p*) become the inner bundles of the stem at node 2, and *a–i* of 2 become the peripheral bundles (Fig. 5). Through the following internode these two sets of bundles run approximately parallel and become the inner rings of



FIGS. 2–6.—Transverse sections through a terminal bud of *P. methysticum*, showing the course of the bundles; × 168.

the next node (node 3, Fig. 6). The union of the two inner rings takes place here. Five methods of joining were observed in the case of the undifferentiated strand: (1) two strands from the same ring may join (Fig. 8, *lm*); (2) two strands from different rings (Fig. 7, *ak*); (3) one strand may divide and join a strand of a different ring (Fig. 8, g^1p); (4) two strands from the same or different rings may unite and then join a branch of a strand from either ring (Fig. 9, *efg, ino*); (5) three strands may join, the result of this, for a short time, being a single inner ring (Fig. 9, 10, *dlm*).

The peripheral bundles at any node may branch. In older nodes this branching may occur just before the peripheral bundles become pith bundles, and part remain in the peripheral ring; the latter will then connect with the bundles of the leaf at the node below (Fig. 19).



Figs. 7–10.—Transverse sections through a terminal bud of *P. methysticum* showing course of bundles; sections follow those in Figs. 2–6; × 168.

The coalescence of the branches of these bundles does not always occur at the node, but may occur above or below it, as follows: (1) branches of the same bundles may join before passing through a node; (2) branches from different bundles may unite; (3) branches of a peripheral bundle of the internode above may join a peripheral bundle of the internode below. Not infrequently strands isolated in the anastomosing of the pith bundles at any node may join the peripheral bundles at that node. The peripheral bundles of any internode, therefore, when young will consist of one set of foliar bundles only; and when older may contain portions of the foliar bundles of the leaves of 3 nodes.

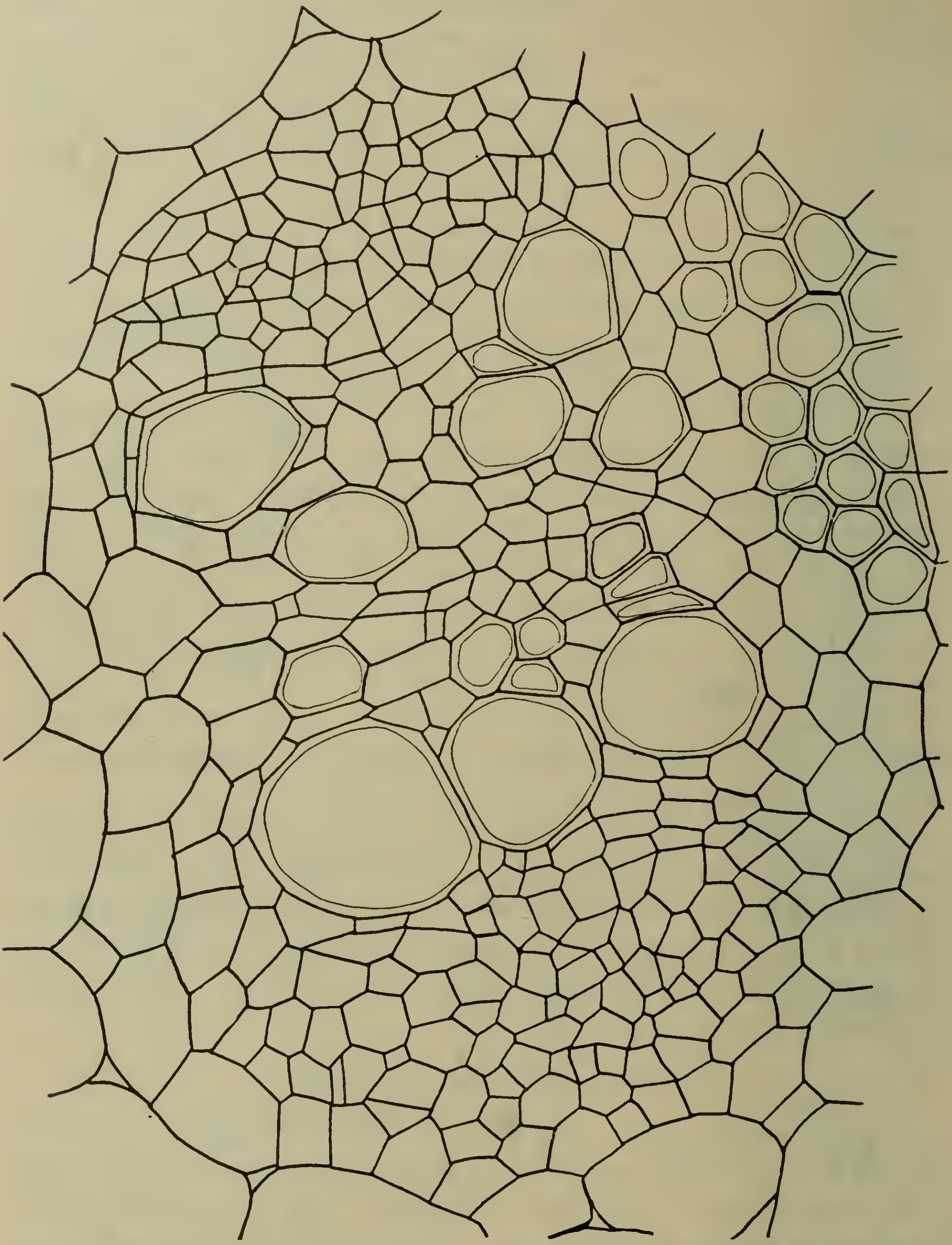
The node in which the strands have become differentiated presents a most complicated appearance. One often finds for a short time xylem entirely surrounding phloem, and vice versa. Bundles may join with either the phloem or xylem together. They may lie side by side and union may occur either in the xylem or in the phloem. Not infrequently the xylem of two bundles may unite, and the phloem of a third join the phloem of either of the others. Strands become separated from bundles and several of these may coalesce to make a bundle, or they may join with other bundles. One often gets cross-sections and longitudinal sections of the same bundle in the same section.

The bundles in one internode are in the periphery, and through the following two internodes are pith bundles. The position in the pith often gives the appearance of two complete rings and one-half of a third ring, when the number of bundles is large; but careful study shows that there are really only two rings. The number of bundles reaches 45–50 in the pith.

Description of Stem in Detail.

As previously stated, the stem of *Piper methysticum* has two sets of bundles which may be designated as the peripheral ring and pith or medullary rings, two in number, and an irregular half-ring which gives the appearance of a third ring at times. The bundle type is open collateral endarch, oriented for the most part in the usual manner. Sometimes, however, one finds the protoxylem points appearing in reverse orientation (Fig. 10, *c–g*). Union is often incomplete and one finds double bundles persisting in the internode, and these may be of two types. The xylem points or the phloem points may be together (Figs. 11, 12).

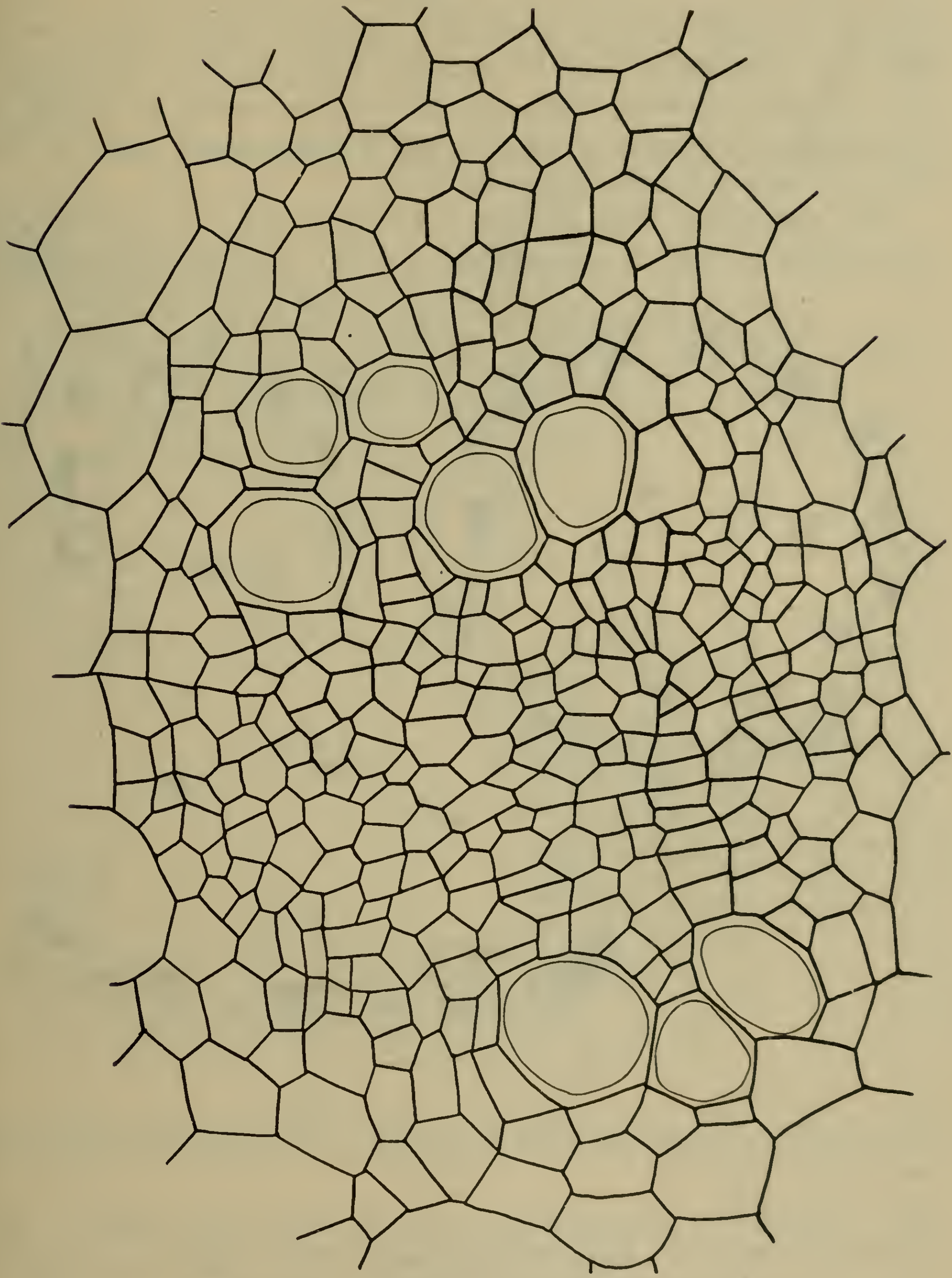
FIG. 11.



Detail of a double bundle with phloem on the outside and lignified tissue at the side; × 820.

The peripheral ring of bundles is formed of two sizes: the primary, those differentiated first; and the secondary, termed supplementary by De Bray[3] (Fig. 13). The secondary bundles are branches of the primary bundles and lie between them. More than one primary bundle may contribute to a secondary one

FIG. 12.



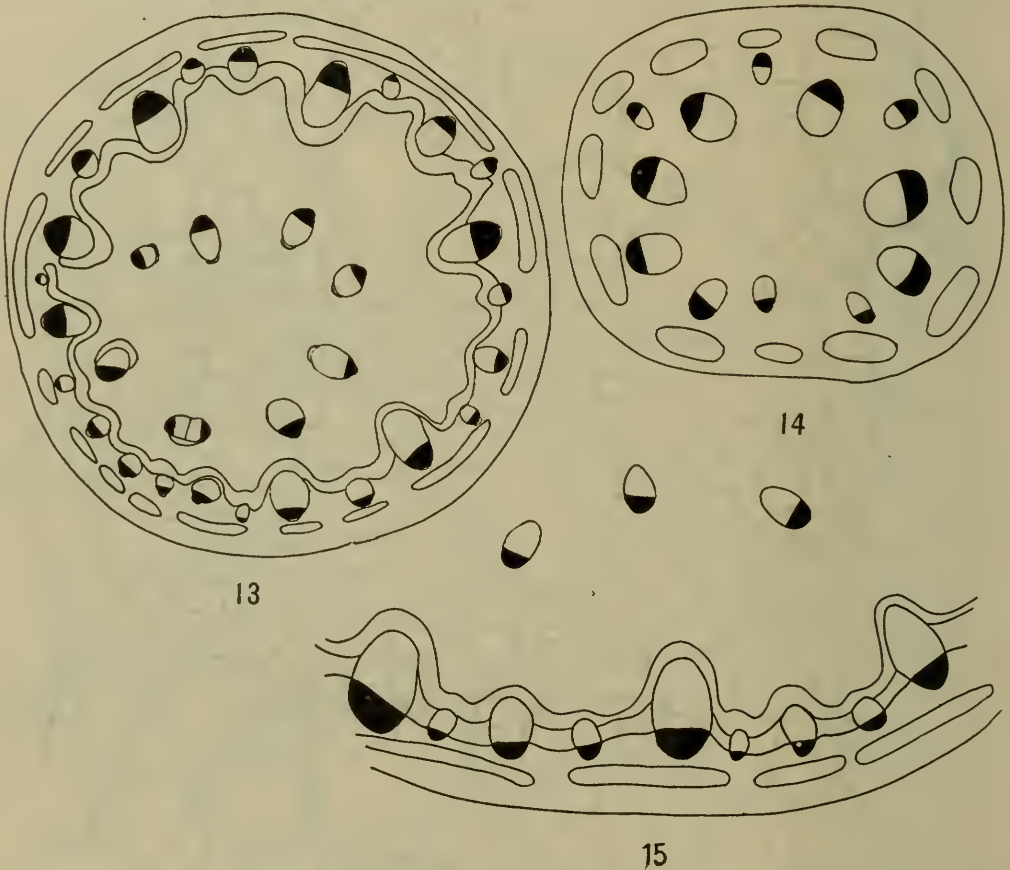
Detail of double bundle with xylem points outside; × 820.

(Fig. 9); that is, two bundles may branch and the branches join. The number of secondary bundles varies from none to 3, according to the age and size of the stem. Near the tip there are none (Fig. 4), as observed by Schmitz.[12]

The inner rings of bundles are approximately the same size.

This does not differ from the majority of the species of *Piper*. Between the pith and the peripheral ring of bundles in the young stem is a continuous band of parenchyma, 4–6 rows thick, which early becomes lignified (Figs. 13, 14). Later, owing to growth of the bundles, this band is broken and patches appear only at the inner portions of the bundles (Fig. 18).

The pericycle consists of only a few cells (Fig. 16) just outside the bundles in both the peripheral and pith systems, and nowhere else. It can be distinguished easily in the young stems by the dense cell contents. Late in the history of the plant the pericycle becomes lignified. There is no differentiated endodermis in either old or young stems.



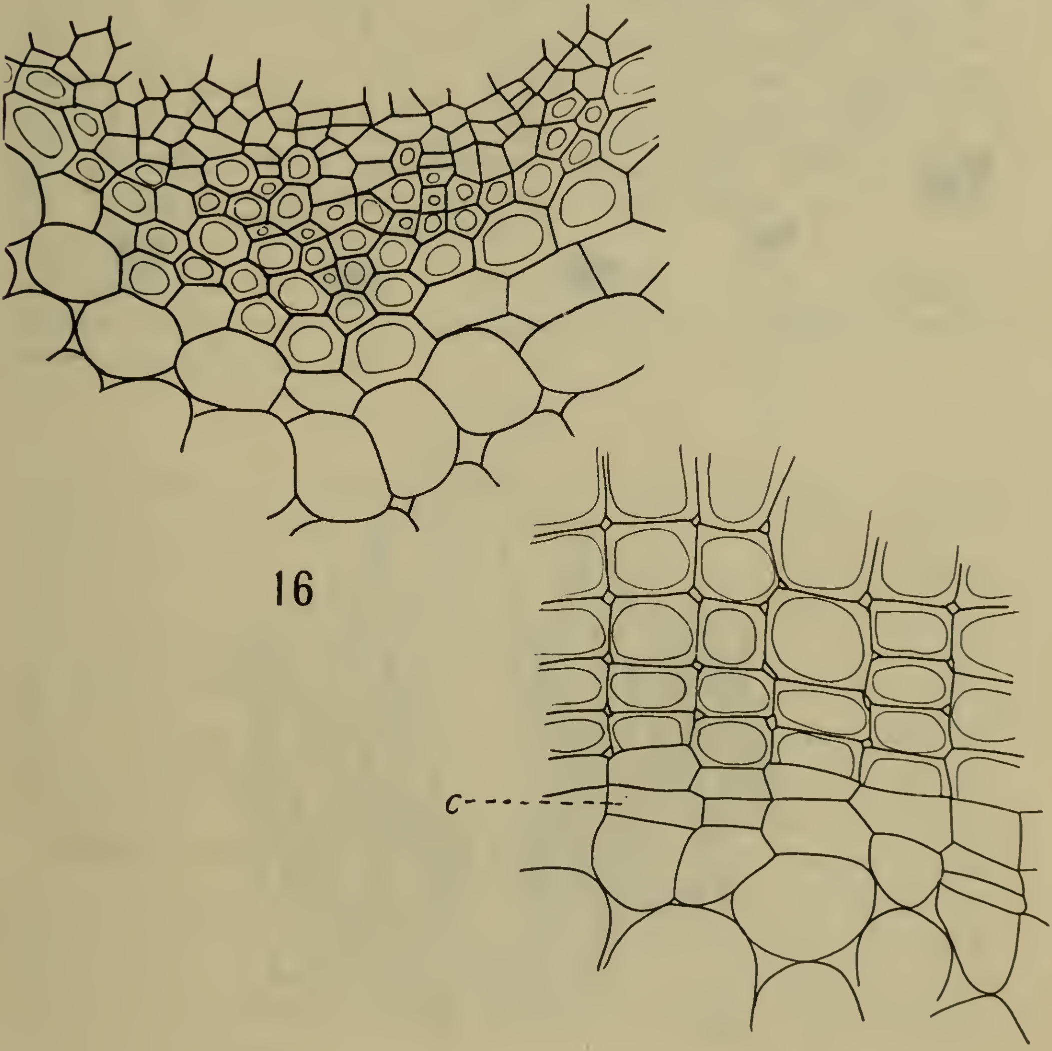
Figs. 13–15.—Fig. 13, young stem of *P. methysticum* after differentiation has been completed, × 80; Fig. 14, petiole, × 101; Fig. 15, sector of stem after interfascicular cambium has been developed, × 101.

In the cortex of the young stem is a continuous band of tissue 7–8 cells wide, which responds to the test for suberin (Tunmann [16]). This is in patches in the older stems. The intercellular spaces of the pith are very large.

SECONDARY ACTIVITY IN THE STEM.

There are two methods by which the stem of *Piper methysticum* enlarges: (1) by active division of pith cells; (2) by cambial activity.

1. In the center of and at regular intervals throughout the pith, groups of cells will divide actively throughout the internode.



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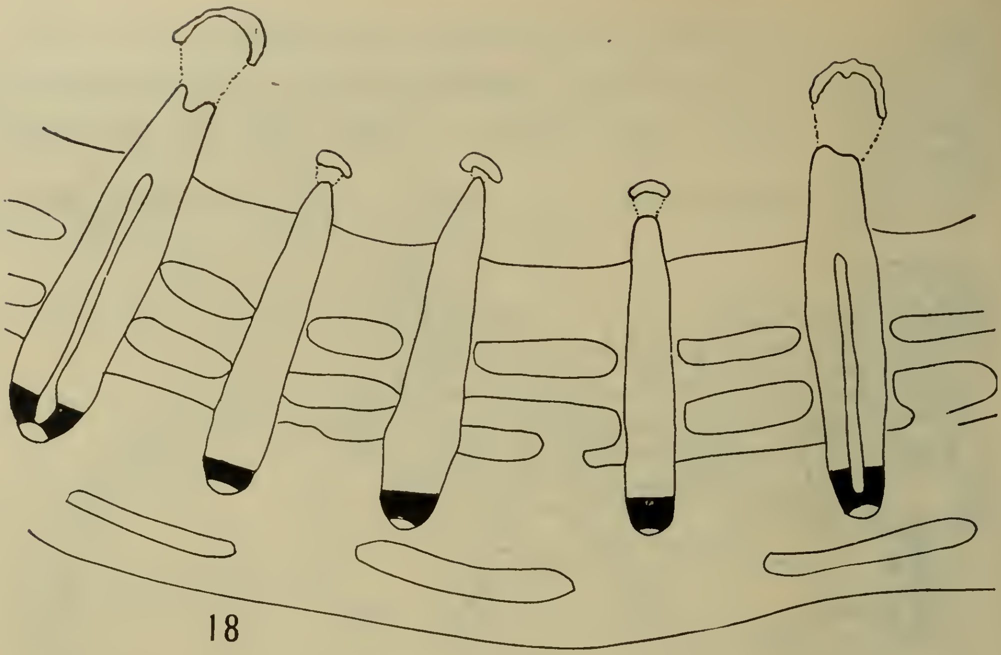
FIGS. 16, 17.—Fig. 16, detail of pericycle of *P. methysticum.* Fig. 17, detail of medullary ray; C. cambium; × 820.

2. Each bundle of both the peripheral and pith rings has a cambium. The inner ones do not enlarge greatly. The outer or peripheral bundles lay down a ring of wood often 4–5 mm. in thickness. The proportion of xylem to phloem is about 8:1 (Fig. 18).



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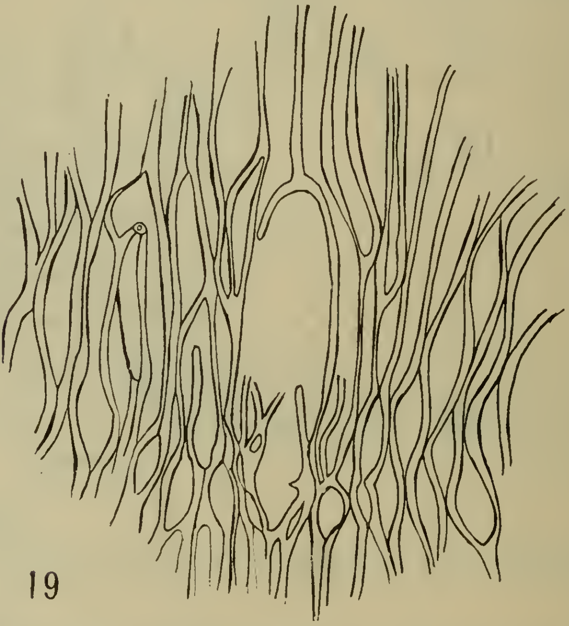

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FIGS. 18, 19.—Fig. 18, section of peripheral ring of the bundles of *P. methysticum* at a mature node, showing banded appearance of the rays, × 35; Fig. 19, tangential section of peripheral bundles, showing branch gap; × 7.

Late in the history of the stem an interfascicular cambium appears (Fig. 15), which cuts off segments on the inside only; very late a few segments may be cut off on the other side (Fig. 17). This closes the stem cylinder. The interfascicular cambium appears much later in the nodes and remains active much longer.

Van Tieghem calls attention to the one-sided action of the cambium in his work on *Piper nigrum*.

The medullary ray becomes lignified and in longitudinal section shows pitted cells. At the node in the largest stems available, cells next to the cambium do not lignify and remain active. These are also scattered at irregular intervals throughout the ray. In section this gives the ray an irregular banded appearance (Fig. 18). There are no growth rings. Much of the wood parenchyma touching the pith retains its activity at the node and divides long after secondary wood has been laid down. This pushes the primary vessels of the bundles apart at great distances, as well as the cells of mechanical issue (Fig. 18).

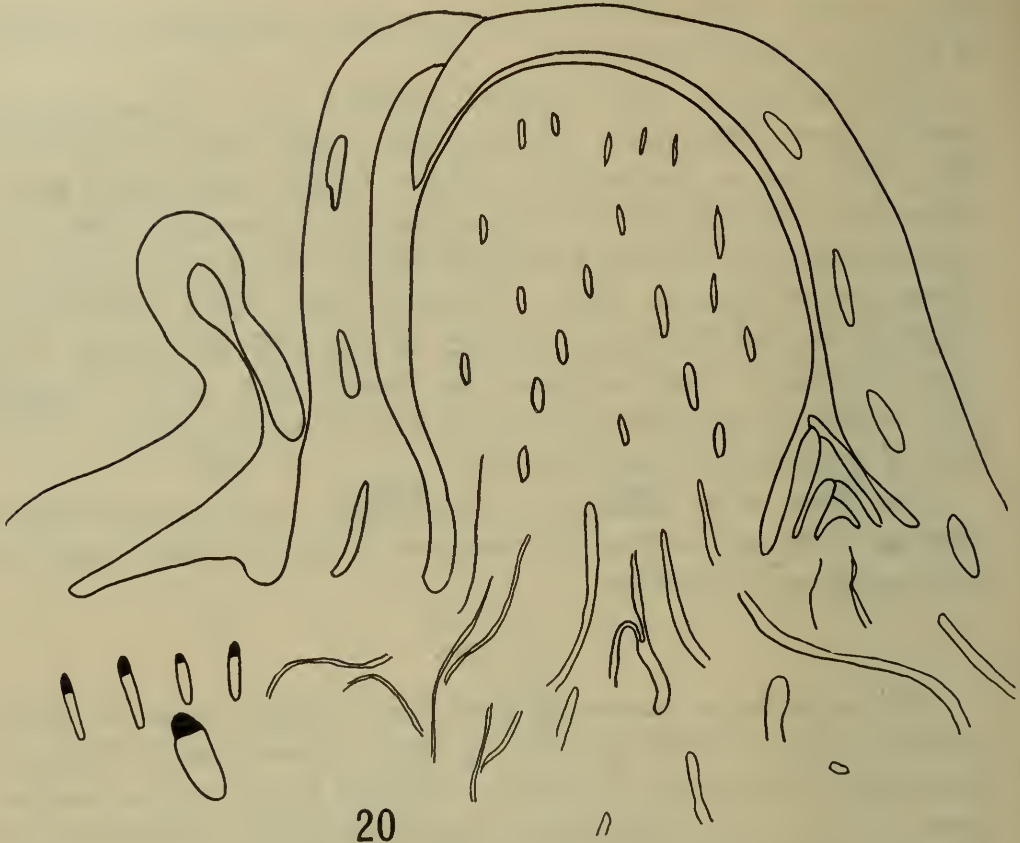
The stem when young is packed with starch and piperin. Mucilage cells are scattered throughout it, and the buds especially are covered with mucilage.

LEAVES.

The leaves have distinct petioles, the sheathing bases of which extend entirely around the stem, which becomes narrow opposite the point of insertion of the leaf. The leaf traces vary in number from 7 to 14. The bundles may be of two sizes. The lower part of the petiole is flattened on one side; the upper part is circular. The bundles form a crescent in the lower portion of the petiole (Fig. 21), this crescent being made complete in the upper portion by the branching of the bundles at the points of the crescent (Fig. 14). The secondary bundles form a more or less complete outer ring, are of the same type as those of the stem, and anastomose at any portion of the petiole. Union of the primary and secondary bundles, however, takes place before the traces enter the blade, which has 7–9 strong palmate veins, the 3 median ones running parallel for a while before they swing out laterally. The vernation of the leaf is involute.

BRANCHING.

Buds are borne in the bases of the sheathing petiole, the number varying from 1 to 3. The appearance of a single bud is often to one side instead of in the median position, which probably accounts for the appearance of branches coming from the side of the leaf. The buds are invested by a large amount of mucilage. The central bundles of the branch connect with those of the stem, and



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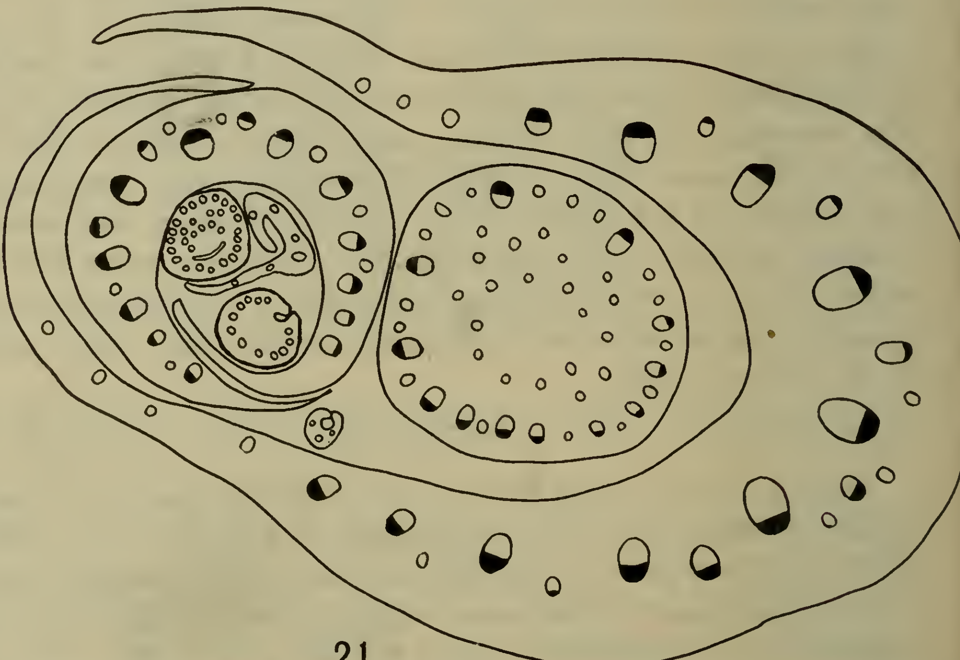

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FIGS. 20, 21.—Fig. 20, transverse section of mature and young buds, × 32. Fig. 21, transverse section through the base of the petiole, showing branches arising in axils of abortive leaves, × 28.

the peripheral ones connect with the peripheral bundles of the stem (Fig. 20). In two cases it was observed that the branch did not develop in the axil of a leaf where only the blade was developed (Fig. 21), which was due probably to the pressure caused by the enveloping sheaths of the preceding leaves.

PIPER UMBELLATUM.

The stem of *Piper umbellatum* is not essentially different from that of *Piper methysticum.* At maturity it has only one ring of pith bundles. The bundles, instead of traversing two nodes as internal bundles before fusing with the next group, traverse but one (Fig. 22). The young plants are covered with hairs, both unicellular and multicellular. The number of leaf traces is 7–9. In the young stem there is an abundance of mucilage scattered in all regions. In the old stem a single mucilage canal appears in the center, which is continuous through the nodes and in the branches; Van Tieghem found none that was continuous through the nodes (Fig. 23).

SUMMARY.

1. The stem of *Piper methysticum* consists of two systems of bundles, peripheral and pith, the latter being in two rows.

2. The peripheral bundles are of two sizes: primary, the larger; secondary, the smaller. The latter are branches of the former.

3. The bundle type is collateral endarch.

4. The bundles are of foliar origin.

5. The bundles, after entering the stem, remain in the peripheral region through one internode and then traverse the pith for two internodes.

6. Both the peripheral and the pith bundles show anastomoses.

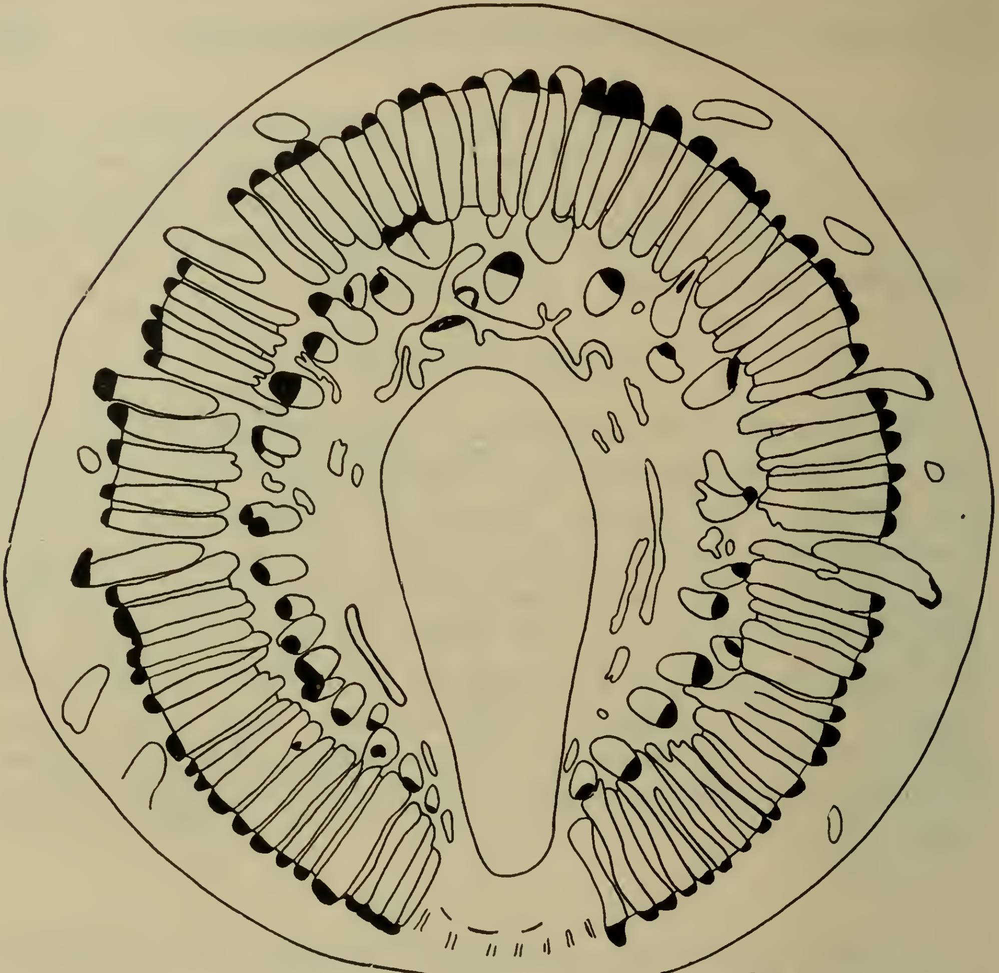
7. The pericycle consists of only a few cells outside the bundles, which become lignified.

8. There is no differentiated endodermis.

9. The stem enlarges by cambial activity and divisions in the pith region.

10. An interfascicular cambium appears late in the internode and cuts off segments only on one side; it comes still later in the nodes.

11. Leaf traces are many.



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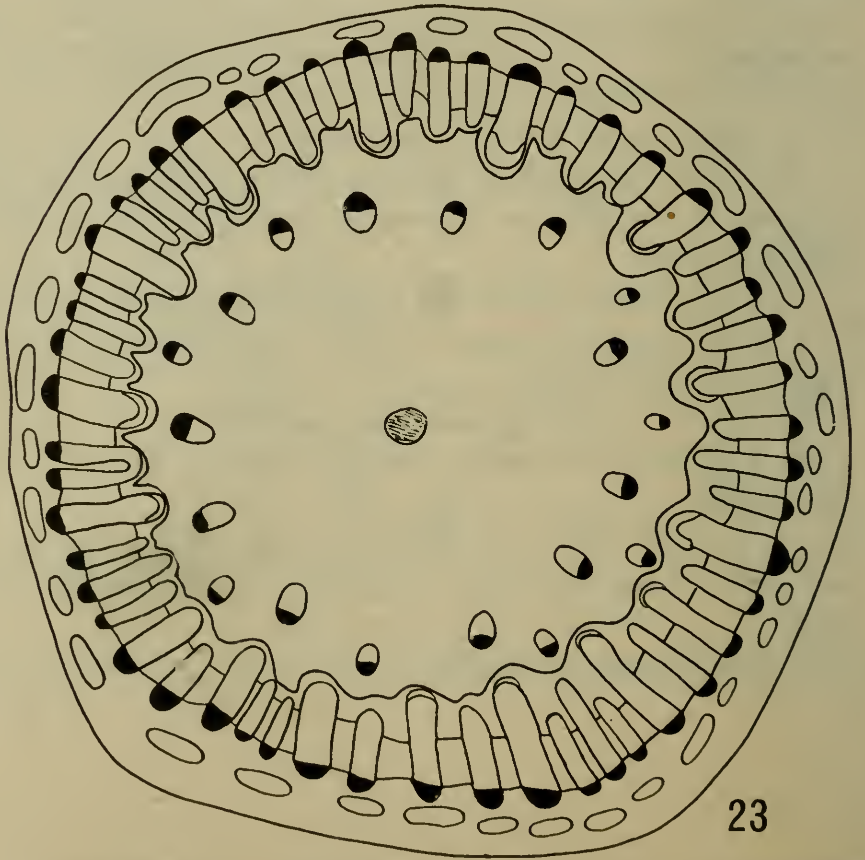

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Figs. 22, 23.—*P. umbellatum;* Fig. 22, section through mature node; Fig. 23, section through internode; × 12.

12. The base of the leaf is sheathing and vernation is involute.

13. Buds vary in number and position.

14. *Piper umbellatum* differs from *Piper methysticum* in the following ways: (1) one ring of pith bundles only; (2) the mucilage canals runs through the center of stem and node; (3) the bundles run through one internode only in the periphery and one in the pith before fusing with those of the leaf above.

15. Both stems are packed, especially when young, with starch, piperin, and mucilage.

16. There are no growth rings.

DISCUSSIONS AND CONCLUSIONS.

The anatomy of *Piper methysticum* and of *Piper umbellatum* agree for the most part with the anatomy of the species of *Piper* already described; especially is this true in reference to the work of De Bray,[3] see also de Bary.[2] Van Tieghem reports a differentiated endodermis in all species of *Piper,* but this was lacking in these forms.

The question of most importance is the relationship shown by these forms. Sinnott and Bailey[13, 14] assert that the most primitive condition of angiosperms was woody, and that there is a tendency toward the herbaceous habit in the more recent groups. These forms show a tendency toward elimination of secondary growth and a breaking up of the woody cylinder in the following characters: (1) the pericycle is broken and all that remains is a small patch outside of each bundle; (2) the interfascicular cambium appears late in the internode and still later in the nodes; when it does occur the activity is primarily on one side; (3) there is a tendency toward the scattering of the bundles in the pith. These, together with the sheathing base of the petiole, the multilacunar (Sinnott[13]) type of node, and the anastomosing of the bundles at the side, show a monocotyledonous tendency. Moreover, the embryo sac of the group shows the elimination of one division in oogenesis.

One may conclude from this combination of characteristics that *Piper methysticum* and *Piper umbellatum* lie in a group well toward the level of monocotyledons, and the conclusion is borne out by the female gametophyte.

The writer is indebted to Professor John M. Coulter for suggestions and criticisms, and to Dr. W. J. G. Land for the material used and for direction and encouragement during the investigation.

University of Chicago.

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FIFTY YEARS OF MANUFACTURING PHARMACY AND BIOLOGY.

The Story of Parke, Davis & Company.

The House of Parke, Davis & Company was born in a drug store. It was not an easy beginning. No experience could surpass in difficulty the almost ceaseless trials of a manufacturing house endeavoring to come into existence fifty years ago. It had first to justify its being. It represented a new idea—and new ideas are ever accepted reluctantly by an unwilling world which clings fast to the old forms.

Dr. Samuel P. Duffield was both a physician and a pharmacist. First trained as a doctor of medicine, he later on attended and was graduated from the University of Giessen in Germany, and there he became deeply interested in the subject of chemistry. He returned to Detroit—the home of the Duffields—and opened a drug store. Soon he developed a small manufacturing business, and called particular attention to his "Ether, Sweet Spirit of Nitre, Oil of Wine, Hoffmann's Anodyne and Blue Pill Mass." This unpretentious announcement was the faint birth-cry of a new industry.

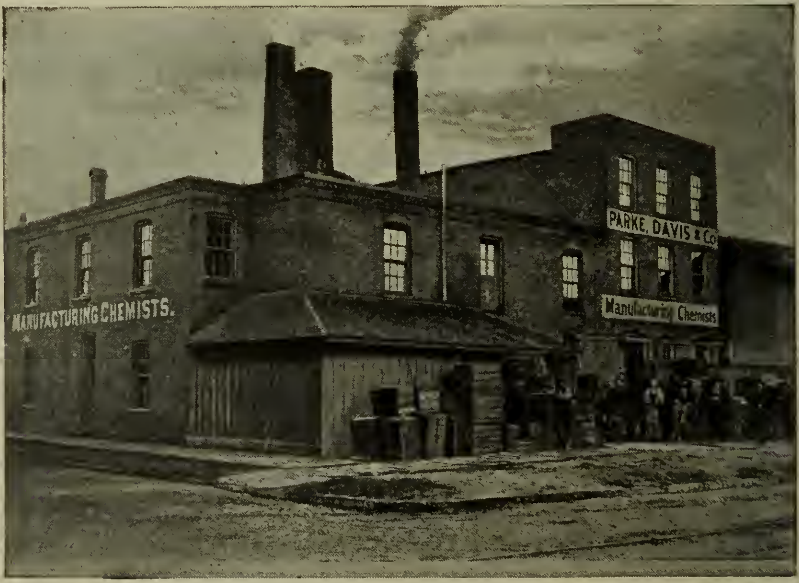
Dr. Duffield's equipment consisted of a still capable of turning out two barrels of alcohol a day, an iron ammonia apparatus, two ether stills, a drug mill and a hydraulic hand press. This was in 1862.

Early Struggles.

The struggles of the next few years may be imagined but can scarcely be described. Dr. Duffield was breaking new ground in more ways than one. Manufacturing pharmacy as he visioned it did not exist, and it had slowly and painfully to prove its right to a place in the sun. Detroit, moreover, was considered in the more populous East to be pretty much in the class of a backwoods settlement, and what good could be expected to come out of Nazareth? The meager shipping facilities then afforded were a grievous handicap. Capital was hard to get. Obstacles and difficulties of a hundred kinds were encountered. Temptations arose on every hand.

All this was reflected, in a way, by Dr. Duffield's frequent change of partners. Associates came and went, one after another, and it was not until 1866 that something like permanence was suggested. In that year Hervey C. Parke was induced to join forces with Dr. Duffield, and the firm name of "Duffield, Parke & Co." was painted on the building. This change of partnership was effected on October 26, 1866—the date we look back upon as signalizing the real beginning of the House as it exists today.

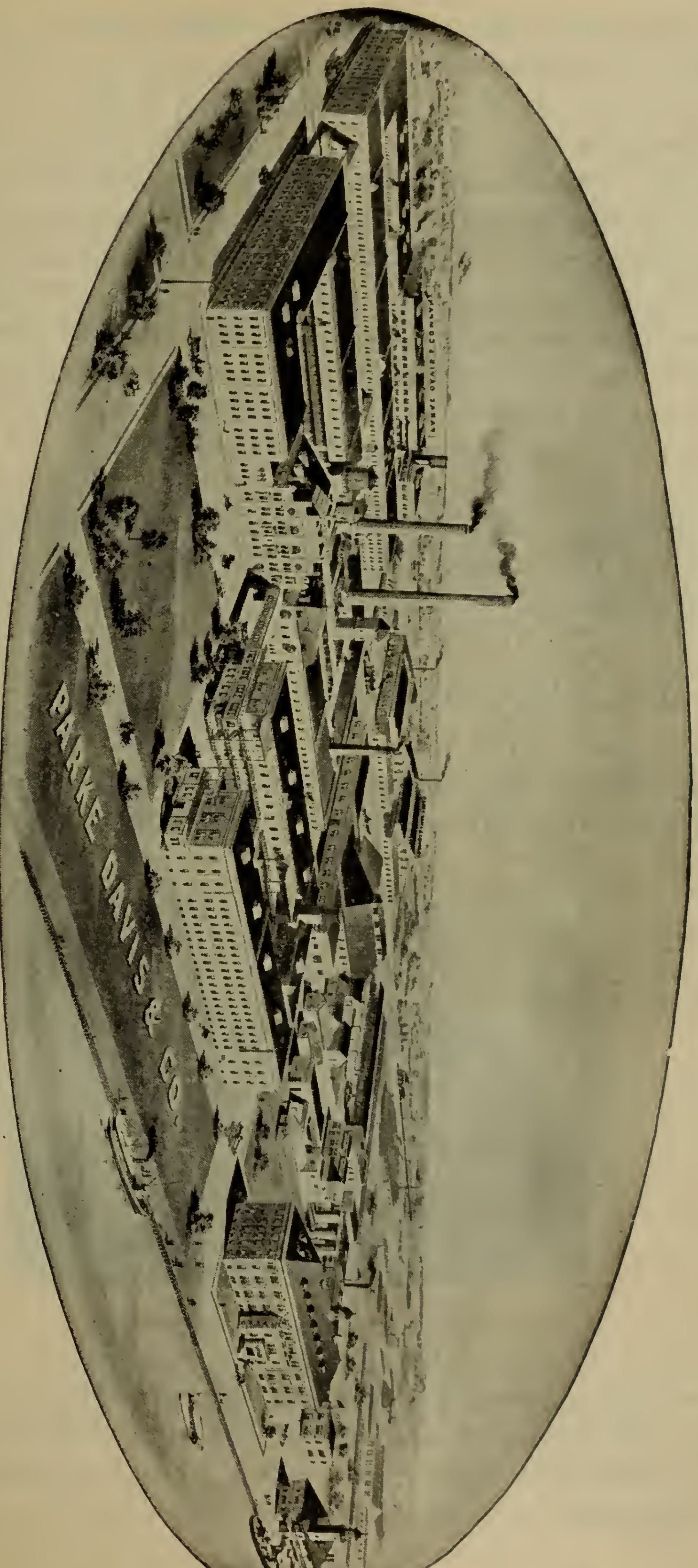
It was only a year later when George S. Davis cast in his fortunes with the enterprise, and with the introduction of both Parke and Davis a new era was promised. Entirely unlike, these men were singularly adapted to supplement each other's abilities. George S. Davis was a creative genius. Great industry, boundless driving power, a rare gift for discovering, developing and organizing talent, a capacity to probe the future and perceive tendencies as well as conditions—these powers, united with Mr. Parke's winning manners and great personal credit, were to carry the house through many a storm into a haven of assured and lasting success. Did they have any inkling of the destiny which was already hovering over them? Probably not. " None climbs so high as he who knows not whither he climbs." It is more than legend that during the early '70's both Parke and Davis were going about Detroit, seeking capital for the development of their new enterprise and finding it almost impossible to obtain.



THE BEGINNING IN 1866.

Early Policies.

But they would not accept defeat. Possessing youth, vigor, ambition, determination, they struggled on amid a host of difficulties, and as the business grew they were in time enabled to move the plant from



GENERAL OFFICES AND LABORATORIES, DETROIT, MICHIGAN, U.S.A.

its original drug-store site to a laboratory specially built on the grounds of the establishment as its exists to-day. This was done just in time to face the panic of '73. How that was weathered heaven only knows! For years the grim fight for bare existence was prolonged. But the year 1877 marked the turning point and witnessed the first profits ever earned by Parke, Davis & Company—fifteen years after Dr. Duffield had begun his work and eleven years after Mr. Parke had become connected with the enterprise!

Now began an era of wonderful growth, marked by bold and original methods. The dominating thought became: "Gain and preserve at any cost the confidence of the best element in the medical profession and the drug trade. Appeal to the physician by methods in harmony with the higher traditions of medical practice. Market no secret product. Publish on every label the exact medicamental composition of the contents. Confine the advertising strictly to the medical profession and the drug trade. Build well to last."

THE FOUNDATION: RESEARCH WORK.

From the first the management realized the vast importance of friendly, satisfied distributors, wholesale and retail. Their co-operation could be assured only by a just, living profit on the preparations sold, and by a constantly increasing demand. How create the demand? Obviously, by genuine scientific work worthy of the name, and by the assiduous cultivation of the physician, the fountainhead of all demand.

RESEARCH LABORATORY.

Research work, indeed, became one of the fundamental ideals and purposes of the house. The founders realized that no institution can achieve a lasting success unless it represents some great idea. If it lack that it may progress for a time, but sooner or later it will be relegated to the oblivion whence it came—unwept, unhonored and unsung. From the very outset Parke, Davis & Company was dedicated to original scientific investigation on the one hand, and to absolute truth and integrity on the other. "*Medicamenta vera*" became the shibboleth of the house, and it was religiously observed amid all the struggles and temptations of the early years.

NEW VEGETABLE DRUGS.

If manufacturing pharmacy was to succeed in those pioneer days, if it was to justify its right to existence, it could only do so by giving the world something which it needed and which it could not otherwise secure. New drugs; improved galenicals; agents more effective for the treatment of disease than had previously been available—the attainment of these objects became and continued the guiding purpose of the house.

It has been said that Mr. Parke joined the enterprise in 1866, and Mr. Davis in 1867. Within three years thereafter Viburnum Prunifolium was introduced to medicine. Guarana and Eucalyptus Globulus soon followed. Coca was presented to the medical profession in the early '70's, a number of years before Köhler discovered the anæsthetic property of the alkaloid cocaine. Then came drugs like Jaborandi, Grindelia Robusta, Jamaica Dogwood, Saw Palmetto, Convallaria, Pichi, Cocillana, Kamala and Areca Nuts.

These and other introductions were made at a time when poverty may be said to have been the daily lot of the concern, when failure was being faced almost hourly, and when it required the insanity of genius to look ahead to the future and to build well upon the foundation rock of human need.

SOUNDS LIKE ROMANCE.

In 1877, after Parke, Davis & Company had become established in the new plant on the river front, a great triumph was achieved in the introduction of Cascara Sagrada—a drug now recognized in all the pharmacopœias of the world. Then followed a costly, energetic investigation of the medicinal flora of Mexico, the West Indies, Cen-

BUILDINGS AT PARKEDALE FARM.

tral America, South America and other foreign countries. Some of the incidents of those days sound like romance rather than stern reality.

In 1885 the distinguished botanist, Dr. Henry H. Rusby, was dispatched to South America to investigate the native drugs and to purchase large supplies of Erythroxylon Coca. The great difficulties of traveling, the pestilential diseases of the swamps, the opposition of hostile tribes—all these and a thousand other conditions have since been described many times by Dr. Rusby on the lecture platform, and one gets here but a faint glimpse of the almost insurmountable obstacles in the pathway of a manufacturing pharmacist during the early years.

Another scientific emissary in those days was Count Hansen, an intrepid explorer. The Count was once sent out by Parke, Davis & Company to secure shipments of Tonga from the Fiji Islands. Tonga had been used in British medicine, but supplies were not available for use in America. No adequate and thorough-going system existed then, as it does now, for the collection, shipment and distribution of crude drugs. One frequently had to go after them where they were supplied by nature, and wrest them often from a hostile and well-nigh inaccessible country.

CUTTING THROUGH THE JUNGLE.

On this particular trip Count Hansen had made an engagement to meet a Fiji chief and his followers at an appointed place on a certain day. The Islanders were to proceed down the river in their war canoes. The Count was to travel on horseback. When he arrived within three miles of the trysting place his horse slipped into a concealed hole in the swamp, broke his leg and injured the rider's knee. Thereupon Count Hansen was literally compelled to cut his way through the jungle for three miles, proceeding as best he could with a wounded knee, and knowing well that if he failed to complete his appointment the natives would disappear and his trip would be in vain. He arrived before the day was out, finished his arrangements with the Islanders, stayed with them until he was able to travel again, and in due course of time the shipment of Tonga reached Detroit!

As the result of endeavors of this kind, carried on among difficulties that seem strange in this day and age, Parke, Davis & Company were enabled to secure and introduce new vegetable drugs to the medical profession. The list was, indeed, a notable one. Many of them are now recognized in the United States Pharmacopœia or the National Formulary, and are almost household words the world over. To-day less emphasis is placed upon the vegetable materia medica, and to some degree the drugs then representing real additions to the armamentarium of the physician have been succeeded by chemical, biological and glandular products. In due course of time the House was to enter these fields of exploration as it had been a pioneer in the field of vegetable materia medica, but of that something will be said later on.

From the very first the results of investigation were published for the benefit of the medical profession. There was introduced and continued for a number of years a series of brochures known as " Working Bulletins." These pamphlets became the repositories of both old and new information about drugs on which the Scientific Staff was working at the time, and they were accepted as being the most exhaustive and complete presentations to be found in the literature. Even yet requests are made occasionally for some of these Bulletins, and it was only the other day that a department of the United States Government told a correspondent, anxious to secure historical and therapeutic information about some vegetable drug, that he would find the best treatment of the subject in one of Parke, Davis & Company's Working Bulletins published over thirty years ago—but unfortunately it was out of print.

CHEMICAL STANDARDIZATION.

Passing on from the work done in the discovery and introduction of new drugs, it may be said that the next contribution to medical and pharmaceutical science had to do with standardization. Thousands of pharmacists still active in practice recall the very serious defects of nearly all medicinal extracts thirty-five years ago—their lack of uniform potency, their great fluctuations in activity between the two extremes of " worthless " and " dangerous "—the entire absence of dependable, unvarying standards of strength, especially for the powerful narcotics and heart-tonics.

The first standardized extract known to pharmacy was introduced by Parke, Davis & Company in September, 1879. In 1883 the number of standardized drug extracts had grown to twenty. The line at first included principally those powerful drugs which are susceptible of chemical assay by the determination of their alkaloidal content—nux vomica, cinchona, belladonna, gelsemium, henbane, ipecac, mandrake, stramonium, etc.—the final product being adjusted, either by concentration or dilution, to a carefully chosen percentage of active principle. Opposition and ridicule could not long retard the triumph of standardization; to-day every pharmacopœia bears its vindication.

PHYSIOLOGICAL ASSAY.

Chemical standardization has its serious limitations, and they were quickly perceived. The principle cannot be applied to a number of powerful agents—ergot, digitalis, convallaria, strophanthus, cannabis indica and all the antitoxic sera—for which no chemical assay of proved worth is as yet available. Here the physiological test on the living animal becomes indispensable.

The first line of physiologically assayed and standardized extracts ever known to pharmacy was marketed by Parke, Davis & Company in the year 1897, and included ergot, Indian cannabis, strophanthus, digitalis and convallaria. To-day not less than 1100 preparations share in the vast improvement which chemical and physiological standardization have alone made possible. Only the physician, who sees every hour that a powerful drug must be tested in the glass tube or on the living animal or on the suffering patient, can appreciate the priceless value of the reform.

BIOLOGICAL LABORATORIES.

Not a single expectation of profit prompted the first beginning in 1894 of the great laboratories now devoted to the production of antitoxic serums, bacterial vaccines, phylacogens, tuberculins, etc., etc. Mr. Davis, then General Manager, was struck with the wonderful results obtained by Behring and Roux from the serum treatment of diphtheria, and entered the biological field solely in a spirit of scientific enterprise. Credit, reputation, he undoubtedly expected; revenue he had then little reason to look for.

The rapid development of serum-therapy and biological medicine during the past twenty years has transformed and enormously expanded the manufacturer's work. The Biological Department now employs a large staff of men devoted exclusively to biological and biochemical research. Over two hundred people are alone engaged in the routine of producing and testing these agents. The beautiful farm of Parkedale, near Rochester, Michigan, embraces seven hundred acres, and on it are hundreds of horses for the production of the antitoxic serums, plus thousands of guinea-pigs, rabbits, dogs, roosters and calves.

ANIMAL GLAND THERAPY.

This is not the place to record the list of biological agents introduced from time to time. It comprises a large number of serums, bacterial vaccines, tuberculins and the like, as well as the group of six phylacogens placed at the disposal of the medical fraternity within the last few years.

The past decade has witnessed a wonderful increase in the medicinal use of ductless glands and a marvelous transformation in the efficacy, the standardized potency and the palatability of the current preparations. A single pound of product offered the physician as it is to-day may be the total yield from two thousand to forty thousand animals. And what notable triumphs in scientific medicine each substance represents! Adrenalin, powerful cardiac and vasomotor stimulant and hemostatic; Pituitrin, priceless oxytocic in uterine inertia; Thyroid Gland for the relief of cretinism and myxedema; Thyreoidectin for the treatment of exophthalmic goitre; Corpora Lutea for mitigating the distress of the natural or artificial menopause—these are only the most notable achievements in a rich and fast-broadening field.

The first animal gland product marketed by Parke, Davis & Company was "Thyroid Desiccated" in 1893. "Suprarenal Glands, Saccharated," in tablets, capsules and powder, was introduced in 1895; "Suprarenal Liquid with Chloretone" in 1900. Both were completely superseded by Takamine's Adrenalin in 1901. Thyreoidectin made its *début* in 1904; Pituitrin in 1908. The latest additions to the remarkable series are the Anterior Lobe of the Pituitary Gland, the Pineal Gland for the treatment of undeveloped or backward children, and the Parathyroid Gland for the treatment of post-operative tetany.

ANIMAL INDUSTRY PRODUCTS.

As far back as 1895 the House began its first studies in the prevention and cure of widespread animal diseases—hog cholera, sheep scab, tuberculosis, blackleg, anthrax, tetanus, glanders, hemoglobinuria (azoturia), contagious abortion, equine influenza, pneumonia canine distemper, etc., perceiving in this work a rich and vast field for scientific enterprise. The production and standardization of trustworthy disinfectants and sheep dips (Kreso and Kreso Dip) have produced an extensive business in the United States and in foreign countries. The Blacklegoids of the Company enjoy a large sale, despite the free distribution of a similar vaccine by the United States Government.

The Department of Animal Industry is of concern to every veterinary surgeon, every farmer, every ranchman and stock-raiser, every horse-breeder and owner of domestic animals. Its work reposes on a solid foundation of scientific research; its products are subjected to the same rigorous testing and standardization which the "human" medicaments of the House must undergo; and its field of service is illimitable. Already it embraces a considerable variety of antitoxic serums, bacterial vaccines and phylacogens, in addition to the broad materia medica of the veterinary practitioner. To its future growth no bounds can be set.

RESEARCH LABORATORIES.

In the late '70's and early '80's the scientific investigations of the House dealt with the alkaloids and other active principles of vegetable drugs; indeed, they formed the indispensable foundation for chemical standardization. Beginning with 1894 this research work entered on a new phase—the study of immunity in all its bearings, the development of physiological assay processes and methods of standardizing disinfectants, the extraction and perfecting of animal gland products, and a searching investigation of syphilis and cancer.

Much of this work is set forth in the published papers and reports of the Research Staff. The fine structure which is devoted to this department was erected in 1902 at a cost of a quarter million. The maintenance cost is heavy, but is never grudged, for in no other commercial enterprise can be found a deeper conviction that the whole future of the pharmaceutical and biological industry will and must be built on original research.

EXPERIMENTAL MEDICINE.

Among definite chemical compounds built up or discovered by the House have been substances like Silvol, Formidine, Nargol, Mercurol, Chloretone, Bromalbin, Iodalbin and Brometone. Taka-diastase, too, ought perhaps to be mentioned in this list of discoveries, although it is not, strictly speaking, a chemical product. So with Pepsin, which has throughout been the subject of constant study, and in the manufacture of which marked improvements have been made from time to time.

In the clinical proving of new medicinal agents at the bedside and in the hospital, we have enjoyed since 1902 the priceless co-operation of thousands of general practitioners and specialists. To them we invariably confide all our laboratory data for corroboration or refutation in a proper series of clinical tests. The reports of these "co-workers" on new agents are treated as strictly confidential and are never published save with the consent of the authors. An adverse report has repeatedly meant the permanent burial of the product. Pending the completion of these clinical studies, whether one year or many years be required, the preparation is never advertised and never sold. The final verdict by the medical jury enables us to base every claim of therapeutic merit not alone on scientific theory or laboratory tests, but also on practical, exhaustive, clinical investigation.

FOREIGN MARKETS.

In the foregoing paragraphs there has been sketched, very briefly and imperfectly, the history of scientific activities. A few words may not be amiss regarding the commercial development of the House.

It was in 1887 that Parke, Davis & Company began to reach out for foreign markets, and here ensued a revival of the obstacles and difficulties of the early days. This time the people of foreign lands had to be convinced that real scientific work could be done in a new country like the United States. The task required prophetic vision. It demanded courage. It meant that the House must possess great confidence in its products, and confidence in the vital importance of its scientific message. For many, many years the attempt to gain a foothold in foreign markets resulted only in a succession of costly and bitter defeats, but in time they were followed by a brilliant and lasting success.

The first manufacturing done by Parke, Davis & Company in Canada dates back to August, 1887. The present Canadian plant began its work on a large scale in January, 1891, and has since required three additions. The Eastern Depot for Canada was opened at Montreal in 1898. An office is now maintained also in Toronto and another in Winnipeg.

The advantage of standardized extracts in time proved a convincing argument in the most conservative markets. The first exports were made to Great Britain through London agents. This arrangement lasted until the founding of a British Branch in January, 1891, by the late F. M. Fisk. The establishment of a manufacturing laboratory in Hounslow was made inevitable by the growth of the business and the many disadvantages attending shipments across the ocean.

From time to time the House has succeeded in establishing itself elsewhere throughout the world. A thriving business in Australia rendered necessary the opening of a branch house in Sydney in 1902, under the management of Cyril C. Murray. The Russian Branch was opened at Petrograd in 1903, and its manager is E. Brier. The Indian Branch, established at Simla, India, in 1899, was removed to Bombay in 1907, and the manager is S. S. Coleman. Two new branches have been opened within the last year—one in Buenos Ayres, Argentine, and the other in Havana, Cuba, and both face a promising outlook.

THE CANADIAN LABORATORY IN WALKERVILLE, ONT.

AMERICAN BRANCHES.

No ambition to expand, no tempting opportunities to build up an extensive export trade, have ever diverted the energies of the House from its paramount interest—the United States market. Thirteen well-stocked branches and depots have been established at strategic, dominating trade centers throughout the country, to give the drug trade swift and satisfactory service.

THE SPANISH AMERICAS.

A very important function of the New York Branch is the conduct of a large department devoted to the sale of products in Mexico, Central America, South America, the Philippines and China. For these purposes, price-lists, labels, printed matter and correspondence in many languages are indispensable. For a number of years, too, Parke, Davis & Company carried on in New York a very large department for the sale of imported vegetable drugs to all manufacturing pharmacists. This was discontinued in 1910, the House preferring to devote itself wholly to manufacture. It remains, nevertheless, the largest importer of crude drugs in the United States.

ADMINISTRATIVE CHANGES.

Little has been said in the foregoing regarding the men who have made Parke, Davis & Company what it is today, and, for reasons of modesty, little will be said. It is significant, however, that in fifty years of existence the House has had but three presidents and three general managers. Mr. Parke, the first president, died in 1898, and was succeeded by Theodore D. Buhl. Mr. Buhl died in 1907, and was in turn succeeded by Frank G. Ryan. Mr. Davis, the first general manager, was followed in 1896 by William M. Warren, and at the death of Mr. Warren, in 1903, the post was filled by the election of Ernest G. Swift. Mr. Ryan and Mr. Swift are actively in the harness to-day.

Passing by the living, of whom it would perhaps be indelicate to say anything by way of praise, a word should be said in recognition of services performed by some of the leaders of the past. Mr. Warren, who succeeded Mr. Davis as general manager, lived to complete an administration of only seven years, and yet during that short period the business was trebled. New laboratories, new branches, a large increase in the foreign trade, many valuable products—all bore witness to the remarkable power and popularity of the new chief. His untimely death at the age of thirty-nine cut short a career of rare promise.

Mr. Buhl, who succeeded Mr. Parke as president, gave to the company the great strength and prestige of a leader in the financial and industrial progress of Detroit. Mr. Wetzel, as secretary and treasurer, was one of the leading figures in the early history of the House, and to him must be given a large measure of credit for the pioneer work done in spreading the name of Parke, Davis & Company in foreign lands. Others there were who made substantial contributions to the cause—who gave lavishly of their ideals, their brains and their ambitions.

Under the present administration the growth of the House in all its departments has continued in accelerating ratio. Branches have been reorganized; many important changes made in the personnel of the staff; hundreds of salesmen added to the small army already "on the road;" the foreign trade increased manyfold; and every activity of the House, whether scientific or commercial, has been aggressively prosecuted. The bane of older houses—"dry rot"—has been avoided by liberal pensions.

In the general treatment of the employees strict discipline is found entirely compatible with a humane, kindly concern for the welfare of the individual. The atmosphere of the House is a happy one; the staff is devoted, loyal, and proudly conscious of the fine traditions which a succession of large-hearted, big-brained men, both living and dead, have developed during fifty years of honest, enlightened and successful toil.

CURRENT LITERATURE.

Saw Palmetto, A Phytochemical Study of the Fruit of Sabal Serrulata.

By Charles August Mann.

After an extensive investigation the author has reached the following conclusions:

1. "The volatile oil so-called, *i.e.*, the mixture of ethyl esters of fatty acids, that is contained in alcoholic galenicals of the drug, is not a volatile oil in the generally accepted sense of the term. Neither is it a so-called ferment oil resulting upon the hydrolysis of a glucoside, such as the oils of wintergreen, sweet birch, mustard, etc. It is formed by condensation of the free fatty acids, which are naturally

contained in the berries, with ethyl alcohol, the preservative. Small amounts of ethyl esters are formed upon fermentation of a sugar, contained in the berries, to ethyl alcohol, if the fresh berries are allowed to stand when they undergo the necessary chemical changes. Considerably larger amounts, however, are formed when, as previously stated, the berries are preserved in alcohol.

2. Mere traces of volatile oil may be obtained from fresh berries, but this does not consist of ethyl esters, at least not to any appreciable extent, but of such of the free fatty acids of the berry as are volatile with water vapor. Owing to the presence of higher fatty acids such an oil is semi-solid. To this extent the true volatile oil of saw palmetto resembles that of the cocoanut, the only other oil of the palm family known at present. Whether a further analogy exists between these two volatile oils cannot be decided until much larger quantities of fresh berries can be distilled, so that sufficient volatile oil for a chemical investigation may be obtained.

3. Although the enzyme lipase has been demonstrated to exist in the berry, its presence is not necessary to explain the condensation of the ethyl alcohol with the free fatty acids to the corresponding ethyl esters. Indeed, the alcohol may even interfere with, if not completely inhibit, the enzyme action if sufficient alcohol could be used. Prolonged contact between the ethyl alcohol and the individual acids has shown that in each case the formation of esters can be accounted for without enzymes or other so-called catalytic agent." (*Bulletin of the University of Wisconsin, No.* 767, 1915.)

C. J. Z.

THE POISONOUS PRINCIPLE OF POISON OAK.

Poison oak (*Rhus diversiloba,* T. and G.) and poison ivy (*Rhus toxicodendron,* L.) are so much alike from the botanical viewpoint that the slight difference in the shape of the leaflets is the only reason for two species. The conservative botanists Greene and Engler consider *R. diversiloba* to be a " type " or " sub-species " of *R. toxicodendron.*

The fact that the pharmacological action of the two species is identical has given the widespread belief that the *poisons* were identical. W. A. Syme claims to have found upon hydrolysis of the poison of *R. toxicodendron,* rhamnose, gallic acid, and fisetin.

The author was unable to secure these same constituents in *R. diversiloba* and thinks it strange that such closely related plants should have such widely different poisonous principles.

The two species have a slightly different range but " such a difference in the chemical nature of the poisons could hardly be laid to a difference in climate or soil."

" Fisetin, gallic acid, and rhamnose, the constituents of Syme's glucoside, are found in large quantities in *Rhus cotinus,* L., and *Rhus rhodanthema.* It might be supposed from Syme's observations that these species would be poisonous. As a matter of fact, however, neither of these species is poisonous."

The work of Dr. Syme was repeated, gasoline being used as the extractive material in preference to ether, which Syme used. Chips of limbs were used in one experiment while leaves were used in another.

In the summary the author states that " the natural glucoside of fisetin, rhamnose and gallic acid is non-toxic," and " there is not sufficient evidence that a poisonous substance which Syme attempted to decompose was not a complex containing a poisonous body and one or more non-toxic glucosides in addition." (J. B. McNair in *Jour. Am. Chem. Soc.,* xxxviii, No. 7, p. 1417, 1916.)

ON THE CONSTITUENTS OF POISON IVY.

Under this title S. F. Acree criticizes the foregoing article of McNair. Dr. Syme worked on the *ether* extract of the *leaves* and *flowers* of one species while McNair worked on the *gasoline* extract of the limbs of the other species under discussion, and secured different results. " He therefore concludes that Syme's work is wrong. The only other comment to be added is that McNair may not have given sufficient weight to the well-known fact that the botanical differences may often be detected only with difficulty whereas the chemical difference may differ widely. This phase of the work has been discussed a number of times, especially by Schorger." Then it was shown that lavender, fennel, etc., produce different oils when grown under different climatic and soil conditions. Also that the distillate of the *wood* of certain pine trees differs decidedly from that of the *leaves* and *twigs* so that " it would be dangerous to assume that the poison occurring in the *leaves and flowers* of Rhus toxicodendron should be found in the *bodywood* of this plant and certainly it would be inadmissable to assume that this same poison, or the same non-toxic constituents should be found in the *limbs* of an entirely different species, *R. diversiloba.*" (S. F. Acree, Jr., in *Jour. Am. Chem. Soc.,* xxxviii, No. 7, p. 1421, 1916.)

C. J. Z.

The Castor-Oil Plant of India.

The castor-oil plant is cultivated throughout India. There are said to be 16 varieties grouped into two types. One is a tall bush or small tree of *perennial* growth, usually planted as a hedge or in lines through the fields where it affords desirable shade to other and more valuable crops. The seed of this type is *large* and contains an abundance of *inferior* oil. The other type is an *annual* plant producing *small* seeds from which the better grades of oil are expressed.

Bengal is the chief exporting province for *oil,* while *seeds* are mostly shipped from Bombay.

Previous to the war the exports of castor-oil from India showed a tendency to diminish, while the traffic in castor seed very materially increased. This is due to three causes; first, most foreign countries have an import tax on the oil and oil cake while the seeds are entered free; second, the transportation of seeds by sea is easier and less expensive than the carriage of the oil; third, improved and expensive machinery in Europe and America has raised the standard of the oil as well as lowered the cost of production. Some European machinery for expressing the oil is used in India. (*Commerce Reports,* No. 228, 1916.)

THIRTEENTH ANNUAL CONVENTION OF THE NATIONAL ASSOCIATION BOARDS OF PHARMACY.

By Prof. E. L. Newcomb.

(*Continued from page 480*)

Recommended that since the Supreme Court of the United States has handed down a decision that the possession of narcotics does not constitute a violation of the "Harrison Act," and since we believe this decision has largely nullified the intentions of the law, we recommend and urge that Congress enact an amendment to the Harrison Law whereby the main objects of this law be not impaired or defeated.

Mr. H. L. Meredith, chairman of the Legislative Committee, was called on for the report of that committee. Recommendations of the committee that were adopted are as follows:

No. 1: Providing that it shall be unlawful for any person, unless he is registered with the United States Collector of Internal Revenue in the district in which he resides, to sell, dispense or give away any preparation or remedy containing any opium or coca leaves, their salts, alkaloids or derivatives or other potent drugs or chemicals which may be enumerated in the so-called Poison or Anti-narcotic laws of the State or District in which he may reside. A detention as well as monetary penalty to be attached. Enforcement to be placed in the care of the state's Pharmacy Board.

No. 2: Providing a heavy penalty for false representation as a registered pharmacist, licentiate in pharmacy, assistant pharmacist, etc.

No. 3: Requiring that every drug store be supplied with a copy of the latest edition of the United States Pharmacopœia and National Formulary. Penalty suggested to be double the cost of the edition mentioned plus cost of prosecution. Enforcement with the Board of Pharmacy.

No. 4: Requiring that the Registered Pharmacist who is in charge of a pharmacy or "department of pharmacy," whether proprietor or manager, shall in addition to displaying his certificate, have his name affixed either upon separate or composite labels placed on medicinal agents, while in charge as Registered Pharmacist. Also, there shall be caused to be conspicuously displayed over the entrance to the drug store or department of pharmacy the name of the Registered Pharmacist in charge. Fine for violation to be paid by the owner or employer. Enforcement in charge of Board of Pharmacy.

No. 5: Requiring the holder of every certificate, when he renews same, in states where renewals are required, to state whether he is a proprietor or an employer. Certificate not to be granted until such information is given.

No. 6: Providing for the appointment by the N.A.B.P. of a committee of five members from this body whose duty it shall be to enter into conference with the proper officials of the Internal Revenue Department, with the end in view that of eliminating from the processes of the Harrison Law such drugs and chemicals which, from their very nature, automatically are eliminated from the class of habit-forming drugs.

Nos. 7 and 8 were rejected.

No. 9: Your Committee recommends that the President, Secretary and Chairman of the Executive Committee constitute a committee whose duty it shall be to confer with the Program Committee of the

A.Ph.A. to the end that the more important sessions of the two bodies be so arranged as to entail the least possible conflict.

President Burton next called for the report of the Advisory Examination Committee, and Secretary Christensen read that report The main thoughts centred on greater efficiency, and it was pointed out that the time would come when the examiners would be required to submit to an examination relative to their qualifications for these important positions. This promotion should be encouraged by the boards of pharmacy.

The report of the Advisory Committee was adopted.

The President appointed a committee composed of Jno. A. Weeks, Texas, Edward Bloomfield, Kentucky, and Edward Walsdorf, Louisiana, to draft a resolution with regard to time of filing applications for Reciprocal Registration. Mr. Bloomfield made the following report:

All applicants for Reciprocal Registration must file their applications with the Secretary of the Board in which he desires to reciprocate within ninety days after receiving the official application blank from the National Secretary. If said applicant for Reciprocal Registration is rejected by the Board of Pharmacy then all fees shall be returned to him (except the $1.00 fee to the Secretary of the Board of Pharmacy from which he applies, for certifying to registration and grades). If said applicant fails to file his application with the Secretary of the Board within ninety days after receiving the same, then said application blank shall be void and said applicant shall forfeit the entire fee. The Secretary of the National Association Boards of Pharmacy shall date said application blank as of the day issued and the Secretary of the State Board shall date said application blank as of the day received.

The report of the committee was adopted, to go into effect the first of October, 1916.

After discussion regarding ways and means of increasing revenue to the Association, a recommendation to increase the annual dues of "Active" member states of the N.A.B.P. from $15.00 to $35.00 was adopted. The fee for application blank for "reciprocal registration" was increased from $5.00 to $15.00, to take effect October 1, 1916.

President Burton called for the report of the Nominating Committee, which was read by H. L. Haussaman, recommending the following officers for next year: President, Lawrence C. Lewis, of

Alabama; first vice-president, John A. Weeks, of Texas; second vice-president, D. W. Ramsaur, of Florida; third vice-president, John A. Leverty, of Connecticut; secretary, H. C. Christensen, of Chicago; treasurer, F. W. Ward, of Memphis. The following were elected to serve on the various committees. Executive committee, E. G. Cox, of Missouri; chairman of the advisory examination committee, H. C. Christensen, of Chicago; Syllabus Committee, Charles H. Skinner, of Vermont.

The report of the committee was adopted and the gentlemen named were elected as officers of the Association for the ensuing year.

The session was adjourned to meet Saturday evening at half-past eight.

Adjourned Fourth Session—Saturday evening.

President Burton called the Association to order in the Assembly Room of the Rittenhouse Hotel, at 8.45 o'clock, and called for the report of the Auditing Committee, which report was presented by E. C. Cox, Missouri, and adopted.

The installation of officers then took place and the convention adjourned.

PHILADELPHIA COLLEGE OF PHARMACY.

Minutes of the Semi-annual Meeting.

The semi-annual meeting of the Philadelphia College of Pharmacy was held September 25, 1916, at 4 P.M. in the Library, the President, Howard B. French, presiding. Fourteen members were present. The minutes of the quarterly meeting, held June 26, were read and approved. The minutes of the Board of Trustees for June and August were read by Mr. Joseph W. England and approved.

The report of the Committee on Nominations was read and ordered entered and filed.

The delegates to the meeting of the American Pharmaceutical Association held at Atlantic City, N. J., September 5–8, reported verbally through Professors Kraemer and Remington. An extended report is published in the American Journal of Pharmacy for October, 1916, p. 463.

In connection with the report of the delegates to the American Pharmaceutical Association a report was made of the work of the committee of the college appointed to co-operate with similar committees appointed by the New York and New Jersey branches of the American Pharmaceutical Association and the parent Association to provide entertainment for the visitors and members of the Association. It was stated that everything passed off very pleasantly and successfully. The committees did well with the funds at their disposal.

Report was made of the exhibition in the museum of the college to celebrate the semi-centennial of the Alumni Association and also made in honor of the meeting of the American Pharmaceutical Association. The exhibit was visited by many pharmacists and the general public. (See p. 448 AMERICAN JOURNAL OF PHARMACY.) There was much detail work necessary in getting the exhibits together and the thanks of the college were voted to the committee for their untiring efforts in making the convention a success.

The secretary reported the names of five members who were delinquent in payment of dues—thereby forfeiting their membership—whereupon they were declared as having forfeited membership.

Election for Trustees.—Before the balloting began Mr. Edwin M. Boring stated he had been a member of the Board of Trustees for 30 years and now desired to withdraw his name as a candidate. His declination was not received. The tellers reported that Messrs. Edwin M. Boring, Theodore Campbell and Charles Leedom had been re-elected to membership in the Board of Trustees for the ensuing three years.

The President stated that this day was the 85th anniversary of the birth of the oldest living graduate of the College, viz., Mr. Frederick Gutekunst, the eminent photographer. The College was indebted to him for many acts of generosity on his part. Other members spoke in a similar vein, when on motion of Professor Remington the Secretary of the College was directed to convey to Mr. Gutekunst its appreciation of his services and express the hope of continued usefulness for the future.

A member alluded to an editorial in one of the Philadelphia daily papers which condemned the advertising of quack medicines—an interesting discussion followed, some of the members favoring thanking the paper quoted, others opposing it. Several questions were brought up, viz., the question of publishing formulas on labels, the use of so-called household remedies; the attitude of the American Medical Association, but no action was taken.

Professor Remington notified the members of the coming awards of scholarships to students and requested information about prospective candidates. The question was asked as to the status of students receiving scholarships who failed to make good, when it was learned that scholarship privileges are withdrawn from such as fail to pass their examinations.

Mr. Beringer stated that there had been no revision of the by-laws for some years. The amendments to the by-laws which have been adopted since the last revision should be included as also the condensed history of the College should be brought up to date. On motion, it was ordered that the Committee on By-laws prepare such revision for publication later.

C. A. Weidemann, M.D.,
Recording Secretary.

ABSTRACTS FROM THE MINUTES OF THE BOARD OF TRUSTEES.

June 6, 1916.—Fourteen members were present. The Committee on Instruction reported having given consideration to the Annual Reports of the Faculty. Professor Kraemer reports having sold 36 of the old microscopes in his laboratory, which have been replaced by new ones. He expects to dispose of the remaining 14 microscopes during this year and requests the purchase of 50 additional microscopes. The committee recommends that there be an address by the President, the Dean and some prominent speaker, at the opening exercises of the College. The Sub-Committee on Special Lecturers, as an adjunct to our curriculum, arranged for a course of very interesting lectures, and the committee has also arranged for a course of special lectures—12 in number—to be given during the next season, providing it meets with the approval of the board. The instruction in the Department of Bacteriology and Hygiene will be very materially increased with the establishment of the post-graduate and advanced courses, and the tuition fee will be $50. Upon the successful completion of this course, a certificate will be awarded.

The Committee on Examinations stated that the Wellcome Cup would not be awarded to the second-year class this year. Mr. French read a draft of a letter to be sent to the Board of Education and the principals of ten high schools in the city, regarding scholarships in the

College. On motion, it was approved. Communications from Prof. Stroup, Dr. Paul S. Pittenger and Mr. Ivor Griffith were read, expressing their appreciation of their appointments.

August 16, 1916.—Special meeting. Twelve members were present. After the call of the special meeting had been read, Mr. French read the following communication from Dr. Edgar F. Smith, Provost of the University of Pennsylvania:

"AUGUST, 15, 1916.

DEAR PRESIDENT FRENCH:

Referring to the correspondence and conversation had with Mr. Bell and myself relative to the taking over by the Philadelphia College of Pharmacy of the Department of Pharmacy of the Medico-Chi agreed to be merged and consolidated into the University, I beg to say that after communication with the members of the Committee in charge, we have agreed to accede to your desire and request that this Department of Pharmacy be transferred and merged into the Philadelphia College of Pharmacy. We do this in the interest of and for promoting higher pharmaceutical education in the City of Philadelphia, and with the understanding that you will add Dr. Sturmer to your professorial staff at the salary he has heretofore been receiving at the Medico-Chi. We are not under any obligations, as I understand it, to engage any of the assistant professors or instructors, but I feel confident that you will recognize any moral claims that may be pressed upon you by any of those who otherwise will be without employment.

I am very much gratified by this arrangement. With best wishes for the success of the Philadelphia College of Pharmacy, I am very sincerely,

[SIGNED.] EDGAR F. SMITH.

TO HOWARD B. FRENCH,
" President, Philadelphia College of Pharmacy."

The Dean moved that the proposition of the University of Pennsylvania be accepted, which was seconded by Mr. England and unanimously adopted. A preamble and resolution was submitted and forwarded to Provost Smith by Mr. Beringer, who signed the same as Chairman of the Board of Trustees and same was attested to by the secretary. Prof. J W. Sturmer was elected as a member of the Faculty and Associate Dean, his services dating from September

1st, 1916. The Dean moved that matters of detail relating to instructions, as made by the merger, be referred to the Committee on Instruction. It was so ordered. It was ordered that proper publicity be given to the merger by the Publicity Committee.

September 1, 1916.—Special meeting. Twelve members were present. Mr. Beringer, on behalf of the Committee on Instruction read a special report pertaining to the merger of the Department of Pharmacy of the Medico-Chirurgical College with the Philadelphia College of Pharmacy and other problems. The report was a lengthy one and gave full detailed information on the various subjects considered. The committee made a number of recommendations and on motion, it was voted to consider them seriatim.

First. Increase of entrance requirements from 15 academic counts—the equivalent of one year's high school work—to 30 academic counts—the equivalent of two years' high school work. This recommendation to become effective with the sessions beginning 1917–1918, and that prompt announcement be made of same. Adopted.

Second. Relating to rules, order and conduct as proposed, and that all rules and regulations in conflict be rescinded. Adopted.

Third. Opening day exercises. The committee referred this matter to the President and Dean. A communication was received from Hon. Edwin S. Stuart, accepting the invitation to address the classes.

Recommendations following the merger of the Medico-Chi Department of Pharmacy with the Philadelphia College of Pharmacy:

Fourth. That Prof. J. W. Sturmer, formerly associated with the Medico-Chirurgical College, in addition to being made Associate Dean of the Philadelphia College of Pharmacy, be elected Professor of Pharmaceutical Chemistry, and that a course in Pharmaceutical Assaying and Testing of Organic Compounds more especially relating to manufacturing pharmacy, be prepared, for the post-graduate course. Adopted.

Fifth. That Prof. F. E. Stewart, formerly associated with the Medico-Chirurgical College, be elected to give a course of lectures on laws relating to pharmacy and pharmaceutical jurisprudence. Adopted.

Sixth. That Prof. C. E. Vanderkleed, formerly associated with the Medico-Chirurgical College, be elected to deliver a course of lectures in Industrial Pharmacy, to students of the higher classes, with mid-year and final examinations. Adopted.

Seventh. That Mr. J. Edward Brewer, formerly associated with the Medico-Chirurgical College, be elected as assistant in the didactic instruction in chemistry, and instructor and full time assistant in the Chemical Laboratory. Adopted.

Eighth. That Dr. Heber W. Youngken, formerly associated with the Medico-Chirurgical College, be made an assistant professor in the Department of Botany and Pharmacognosy, and assistant curator of the museum. Adopted.

Ninth. That Dr. R. P. Fischelis, formerly associated with the Medico-Chirurgical College, be elected to deliver a course of lectures in connection with commercial pharmacy instruction and on allied subjects, such as pharmaceutical journalism and advertising. Adopted.

Tenth. To establish a three years' course, the last year of which shall be a complete daily course of not less than five days per week, for at least thirty weeks, in resident laboratory and didactic instruction of the College and based upon the completion of our two-year course in pharmacy or its equivalent. That the entrance requirements be the completion of a four years' high school course or its equivalent (60 academic counts). That store experience be not required as a pre-requisite for graduation, and that the degree of Pharmaceutical Chemist (Ph. C.) be awarded upon the successful completion of the course. Adopted.

Mr. Beringer stated that proposed changes in the By-laws made necessary by the merger would be presented to the Board of Trustees.

News Item.

Prof. John Uri Lloyd was given a Testimonial Dinner at the Hotel Gibson, Cincinnati, Ohio, Tuesday evening, October 17th, by the Cincinnati branch of the American Pharmaceutical Association, in honor of his receiving the degree of Doctor of Science which was conferred on him by the University of Cincinnati. The banquet was attended by a large number of druggists and many prominent men in other walks of life. Among the speakers were Frank H. Freericks; Charles W. Dabney, President of the University of Cincinnati; Judge R. B. Smith; Dr. Martin Fischer; and Prof. C. T. P. Fennel, Dean of the Cincinnati College of Pharmacy. Fred. S. Kottem, Secretary of the Ohio Valley Druggists' Association, was the Chairman of the Committee on Arrangements.

DIED NOVEMBER 25, 1916

Martin J. Wilbert, Ph.M., Phar.D.

MEMBER OF THE
PUBLICATION COMMITTEE OF THIS JOURNAL

A Memoir will appear in a subsequent number

THE AMERICAN
JOURNAL OF PHARMACY

DECEMBER, 1916

PHARMACEUTICAL EXHIBIT AT THE PHILADELPHIA COLLEGE OF PHARMACY.

By Robert P. Fischelis, B.Sc., Phar.D.

When we speak of the Civil War to-day, our thoughts go back vaguely to some period in American history which was considerably "before the time" of any man less than fifty-five years of age, and is little more than an indefinite memory to the man of sixty-five or seventy. When we try to think back still further to the War of 1812, most of us feel that we are bordering on the realm of ancient history. Yet we must go back in thought to less than ten years after the War of 1812 and to about forty years before the opening gun of the Civil War was fired if we are to attempt to visualize the beginning of the first College of Pharmacy in this country.

Almost a century has gone by since that little group of apothecaries of Philadelphia held their memorable meeting in Carpenter's Hall on February 23, 1821, out of which grew the Philadelphia College of Pharmacy. On the date mentioned these Philadelphia pharmacists organized themselves into a society which they called The Philadelphia College of Apothecaries, "for the two-fold purpose of providing a system of instruction in pharmacy and subjecting themselves to regulations in their business."

The very mention of Carpenter's Hall is enough to attract the attention and compel the respect of anyone who has had even the merest smattering of American history. And what is more fitting than that an institution which has grown up to be respected and revered by thousands of loyal alumni and friends should have originated in a building so intimately connected with the early history of the United States? The graduates of the Philadelphia College of Pharmacy, numbering now about 6500, have long ago organized themselves into a powerful Alumni Association, and are responsible for much of the progress that has been made in the institution since its inception. It was therefore extremely proper that the fiftieth anniversary of the Alumni Association of this College, coming as it did on the occasion of the Sixty-fourth Annual Convention of the American Pharmaceutical Association held at Atlantic City, should be partly celebrated by an historical exhibit covering the activities of the college in the ninety-five years or more of its existence. The exhibit was opened August 30th and was continued until September 30th, 1916.

It goes without saying that it was quite an undertaking for anyone to attempt to do justice in one exhibit to all of the activities of a school of pharmacy, which has wielded as great an influence in professional circles over a span of almost one hundred years, as has the Philadelphia College of Pharmacy. How well and successfully this was done is already a matter of record, and the favorable comments of the many interested people from all corners of the United States, who came to see the exhibit, must have been music to the ears of those who labored so hard to make it a success.

Usually men pay but little attention to history while it is in the making, but age is bound to lend interest to the happenings of past decades. And so it is with pharmacy. If we would but stop to realize how anxious future generations will be to delve into the work of the present day, we would very likely try to make our footprints on the sands of time just as clear-cut and distinct as possible. Fortunately, those who have been and are now active in the management of the Philadelphia College of Pharmacy have always had a due regard for the historical value of things pharmaceutical, and their painstaking efforts in preserving past records showed forth in the exhibit which we are about to describe.

While the major portion of the exhibit was confined to the Museum of the College, the exhibit as a whole really extended over the entire school building. Each laboratory and lecture room had some of its rare collections on view, but the things of greatest interest to the many, were exhibited in the Museum.

The contrast between ideal pharmacy, as it should be practised in the present day and as it was practised in the past, was portrayed most forcibly in the exhibit of the "model pharmacy of the period of 1921," with its laboratories and excellent equipment, on the one hand, and the old Glentworth Drug Store, established in 1812, on the other. A bit of history regarding this old establishment will not be amiss at this point.

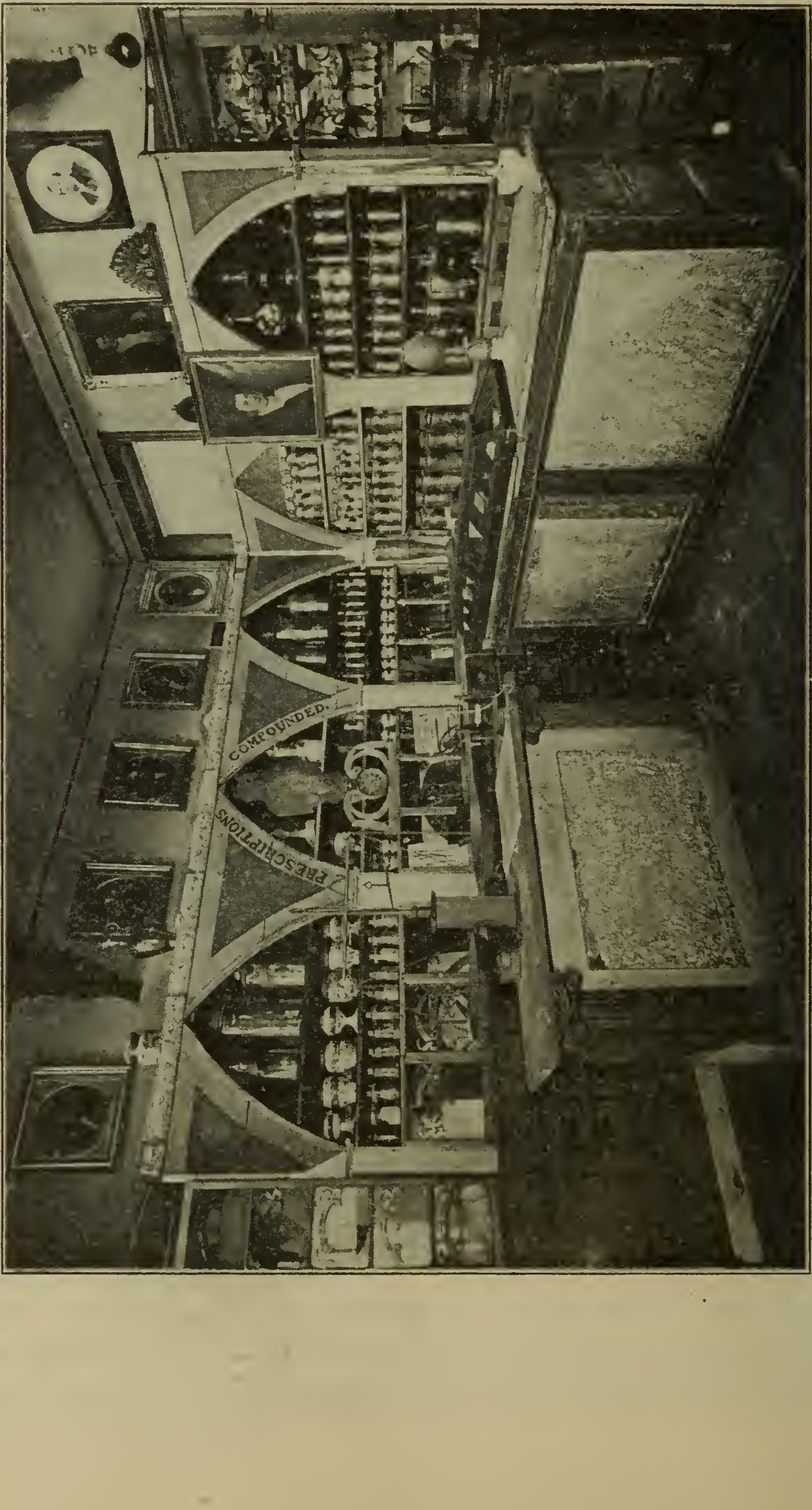
THE GLENTWORTH PHARMACY.

George Glentworth opened this historical establishment in 1812 at the northeast corner of Sassafras and Chester Streets, the old number being 287 Sassafras Street. This thoroughfare has since lost its botanical name and is now known as Race Street. In the early days Glentworth's Drug Store was known as a "country drug store." Philadelphians of the present generation will hardly be able to imagine any establishment less than half a dozen blocks' distance from City Hall as a "country store." The Glentworth family conducted this apothecary shop for more than ninety-two years, without making any pronounced alterations or changes in its appearance. We have been told by a member of the Glentworth family that in 1816 or thereabouts, medical and pharmaceutical lectures were given on the second floor of the Glentworth store, and the men who attended these lectures were later instrumental in forming the Philadelphia College of Apothecaries. The certificate of membership in this organization belonging to the elder Glentworth and displayed in his store is dated October, 1821, and as far as is known, this is the only certificate of membership in the Philadelphia College extant, which still bears the old name of "Philadelphia College of Apothecaries," the word "Apothecaries" having been changed to "Pharmacy" in the second year of its existence.

As can be imagined, this store grew to be a Philadelphia landmark and many of its peculiarities were widely discussed. Two of its devices attracted particular attention, one being a sign consisting of an old head that would turn and look first one way and then the other. The second was the old painted owl that greeted the customer from the top of the central fixture as he entered. By means of a mechanical device, this owl could be made to flap its wings, move its eyes and bill and make a noise like the real bird. It is said that the proprietor had a great deal of fun with this contraption, especially in frightening children.

That Glentworth was a firm believer in preparedness is evidenced by the provision he made for taking in and handing out prescriptions after dark. He had a small opening cut into a panel of the main door leading into his store. He fitted a small door over this opening which could, of course, be locked from the inside. There were few, if any policemen in those early days and this arrangement was an early nineteenth century example of the "safety first" idea.

Fig. 1.



An old Philadelphia drug store of the last century.

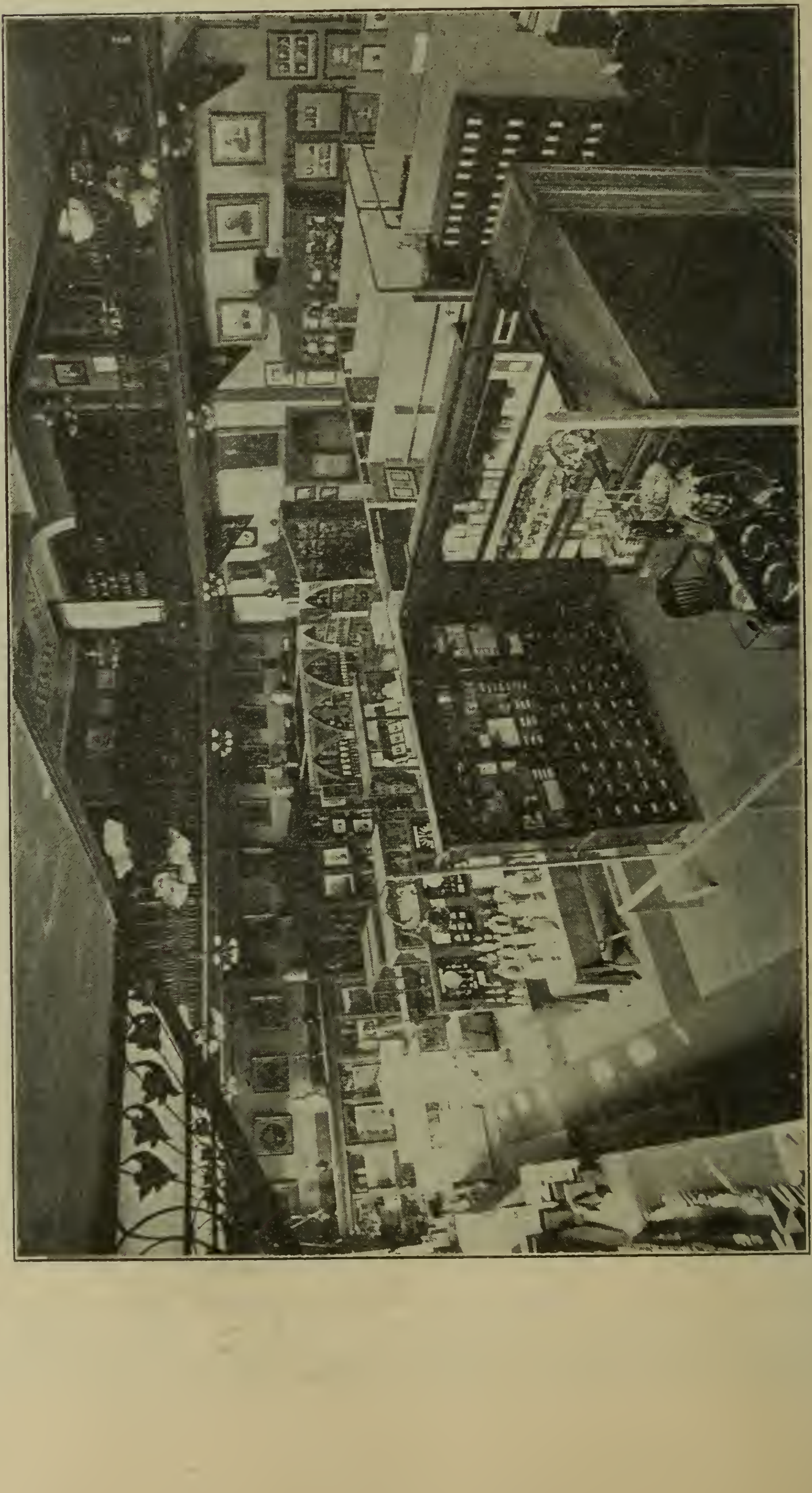
When someone would come to have a prescription filled after the store was closed for the night, it was necessary to arouse the druggist by means of the night bell. The small door would then be opened and the druggist's hand would reach out after the prescription, after which the door was again locked and the bearer of the prescription waited outside until the medicine was ready. The small door would then be opened again and after the money was handed in, the prescription would be handed out.

The show bottles in this old apothecary shop were filled with applejack said to have been prepared in 1812. Some of this one-time beverage is still in existence, but it has become very heavy and oily in appearance. A few years ago the Philadelphia College of Pharmacy was presented with the fixtures and furnishings of this store intact, and they are now a part of the permanent museum exhibit at the college. For this special Alumni Exhibit the store had been reconstructed, and as one entered the section of the Museum where it was being shown, it seemed as though a curtain had suddenly been raised permitting one to peer into a past age. The fixtures resemble the Gothic type of architecture somewhat. The clerk's sleeping bunk under the counter, as well as the huge night bell, were very much in evidence. The owl, already spoken of as a source of amusement and mystification, was also on display in its accustomed place. On the counter there were the old-time scales, an old triturating and also a contusing mortar, an ancient carbonator for preparing one or two glasses of carbonated water extemporaneously, and the curious old counter show cases filled with many old time proprietary preparations.

UNFAMILIAR LABELS ATTRACT ATTENTION

Many of the drawer labels were no doubt unfamiliar or unintelligible to the younger clerk or druggist who visited the exhibit, but perhaps the older men in the profession have recollections of calls for "Rubia," "Statice" and "Symphytum." Wall case labels included such curiosities as "Cephalic Snuff," "Breast Salve," "Sodiic Powders" and "Cajiput" oil. The large crude unfinished shelf bottles pointed to an age when the manufacture of glassware was still in its infancy. There were two-gallon containers for Tincture of Opium, Camphorated Tincture of Opium, Acid Pyroligneous, Tinctures of Persimmons, Sago, Althæa Flowers, and a five-gallon

FIG. 2



General view of the exhibition.

container labelled " Duffy's Elixir " which contained applejack, probably one hundred years old. The queer-shaped gaudily decorated jars and gallipots looked very interesting. The general run of stock bottle and jar labels were unintelligible to all but students of pharmaceutical history.

Among the titles noted were:

Flores Zinci, G. Succini Opt., Ethiops Mineral, Sacch. Saturni, Ærugo Dest., Corall. Ppt., Fer. Limat., Crocus Martis, Antim. Vit., Cl. Nicotian., Lytt. Tereginth., Phos. Hydrarg., and Tr. Castor.

It was but a few steps from 1812 to 1921 at the exhibit, but, no doubt the pharmacist who held sway in the old Glentworth store would feel very much out of place in the model pharmacy of 1921, and, very likely, the pharmacist of the present day would feel just as strarge in the old-time store.

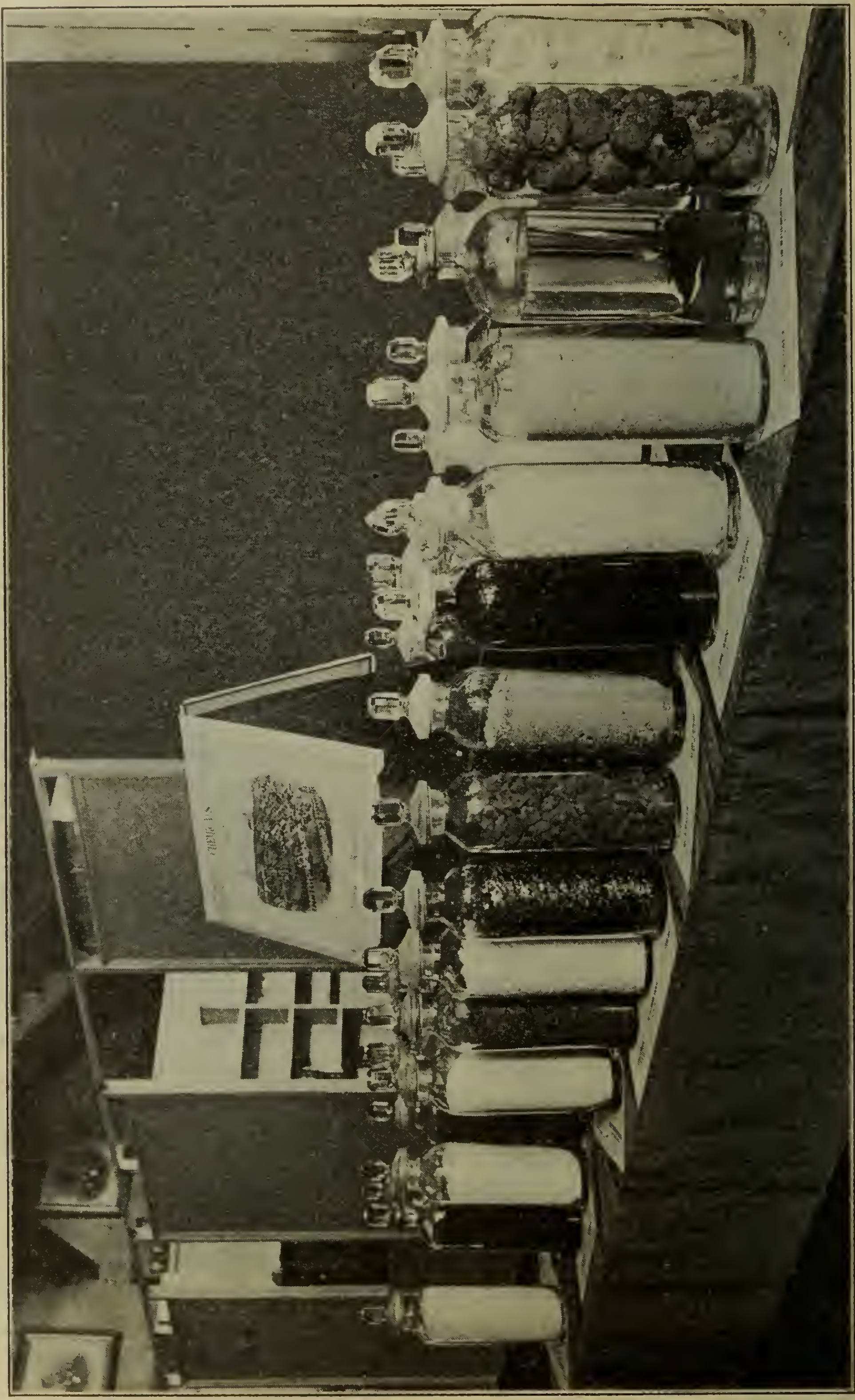
THE MODEL PHARMACY OF 1921.

The first section of the model drug store seen, as one entered from the outside, was fitted up as a salesroom for toilet articles, surgical goods, drugs and the more ethical side lines of the retail store. Proprietary medicines were conspicuous by their absence. In the foreground there was a public telephone booth which seems to be universally recognized as a necessity in every well equipped pharmacy, and in the middle of the floor there was a white-enameled Mulford biological refrigerator for the preservation of biological products, which helped to lend an air of professionalism to the establishment. A swinging door led from the well-furnished salesroom to the prescription department, immediately adjoining. In addition to being equipped with all of the latest devices for facilitating prescription work, there was a complete office equipment in one section of this department,—a desk, an adding machine, a typewriter, a modern accounting system, a safe, and a druggist's five-foot book-shelf holding the indispensable modern works on pharmacy. Here, too, there was an exhibit of filled prescriptions illustrating the proper style of containers and methods of wrapping and finishing packages.

FINISHING AND MANUFACTURING LABORATORIES.

Next to the prescription department there was a completely equipped analytical and biological laboratory with the necessary apparatus for performing physical, chemical and biological tests. A

Fig. 3.



Powers-Weightman-Rosengarten's exhibit of high-grade chemicals and crude drugs from which they were made. Photograph by William Phillipi and Brother, Philadelphia.

complete set of reagents necessary to perform the tests of the U. S. P. and N. F. was included, and the autoclave, incubator, microscope, culture tubes, etc., on display were evidences of preparedness for doing such bacteriological work as physicians might require of the pharmacist.

Following the analytical and biological laboratory there came a well equipped manufacturing department with rows of percolators and receiving bottles on a specially constructed rack, a Remington still, funnels, evaporating dishes, tablet machine, and many other pieces of apparatus which are used in the manufacturing department of a first-class store. Finally there was the drug examination laboratory for the study of crude and powdered drugs. This consisted of a type collection of crude and powdered drugs, microscopic sections, drawings and mounted specimens together with instruments for identifying them.

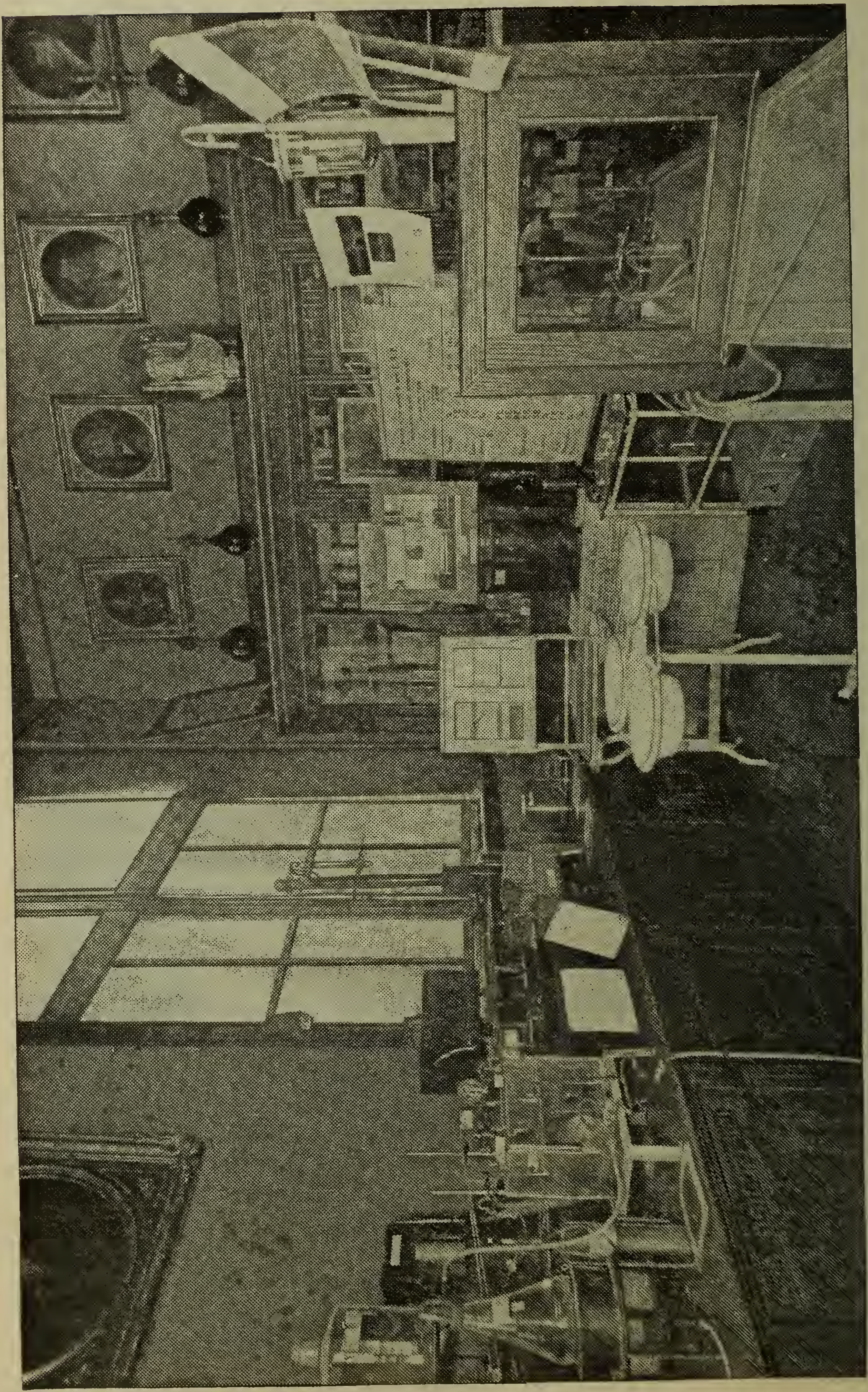
This, in brief, describes the departments of the " model pharmacy of 1921 " and while many of those who inspected it may have felt that it was too ideal, yet there are stores at present which are catering to just the kind of work for which the " model " pharmacy was equipped and as time goes on there are bound to be more of them. Even those who have the greatest faith in the future of professional pharmacy do not believe that drug stores generally will so revolutionize themselves by 1921 as to conform to the " model." However, the line of demarcation between purely commercial and purely prescription and laboratory establishments is becoming visible and an official separation may not be as far distant as we are prone to think.

THE MARTINDALE HERBARIUM.

Passing now to some of the other many interesting portions of this historical exhibit, we come first to the Martindale Herbarium. This great collection of American plants was presented to the College by President Howard B. French and Messrs. Smith, Kline and French, April 3, 1894, after having been purchased from the estate of Isaac C. Martindale of Camden, New Jersey.

The collection consists of seven large walnut cases, compactly filled with mounted specimens. It is hardly possible to form any definite idea of the number of plants contained in this herbarium as many of the sheets bear several specimens of certain plants obtained from different localities. A number of these specimens were taken out of the cases and placed in the botanical section of the exhibit. All

FIG. 4



Partial view of laboratory equipped for carrying on biochemical assaying. To the left is the apparatus used for testing pituitary extract by the isolated uterus method. The Pittenger multiple operating table with kymograph case for blood pressure work on dogs is shown at the extreme right. This laboratory was equipped by the H. K. Mulford Company for the P. C. P. exhibit.

of these were mounted on white paper and properly arranged in heavy manila paper genus covers, and in natural order divisions, the plan of arrangement adopted being that of Durand's Index corresponding with the nomenclature of the Genera Plantarum of Bentham and Hooker.

The systematic arrangement and perfect order of this herbarium have always been admired by visiting botanists and those who viewed this exhibit were not exceptional in this respect. It is estimated that in the collection and arrangement of this magnificent herbarium Mr. Martindale spent at least fifteen thousand dollars. Beyond any statement of its money value, the true value of this collection is in its importance to scientific study and investigations. A detailed account written by Mr. George M. Beringer of the Martindale Herbarium, which, as has already been stated, is a part of the permanent museum collection of the college, was published in the AMERICAN JOURNAL OF PHARMACY, Volume 66, No. 5, page 251.

PHARMACOPŒIAL EXHIBIT.

The copy of the ninth revision of the United States Pharmacopœia shown in one section of the exhibit attracted considerable attention because, at the time of the exhibit, it was new to the majority of pharmacists.

There was also on view a complete set of the Pharmacopœias of the United States and a representative showing of the Pharmacopœias of the several nations of the world. A complete set of the several editions of the United States Dispensatory and a considerable amount of material illustrating the methods employed and the character of the work done by the Committee of Revision of the United States Pharmacopœia were also shown. In this connection mention should be made of the voting and instruction sheets issued by the late Charles Rice, when he was Chairman of the Revision Committee. The painstaking effort and attention to detail displayed in getting up the instructions and other data to be sent to members, with the poor facilities at his command, are certainly worth more than passing comment. A complete set of the earlier Digest of Comments on the Pharmacopœia, and a complete set of the present Digest of Comments on the Pharmacopœia and the National Formulary were displayed and attention was directed to the comprehensiveness of the latter publication by a sign which read:

> The Digest of Comments, originated by Charles Rice, has grown to be the greatest work of reference on the U.S.P. and N.F.

SCIENTIFIC BOOK EXHIBITS.

J. B. Lippincott Co., P. Blakiston's Sons & Co., Lea and Febiger, Philadelphia Book Co., and W. B. Saunders & Co., all had extensive exhibits of their scientific books on view and many of the volumes bore, as authors, the names of members of the Philadelphia College faculty, as well as those of prominent alumni who are identified with other schools.

A permanent case in the library of the College contains historic scientific books covering a period of three centuries and along with the book exhibits mentioned above, there were on view volumes belonging to the college dating back to the seventeenth and eighteenth centuries.

MISCELLANEOUS CONTRIBUTIONS FROM THE PERMANENT MUSEUM EXHIBIT.

Three large glass cases placed in one section of the museum were filled with contributions from the permanent collection of the Philadelphia College Museum. Among these were the first spectroscope made and used in the United States; an ancient sign used by Townsend Speakman (born 1748), the first chemist and druggist in Philadelphia; a Liebig condenser made by Professor J. P. Remington at the age of fourteen; an old-time sand shaking box for blotting letters and wafer seals used in sealing letters before the days of envelopes; a balance taken from the Spanish warship Santa Maria, sunk in Santiago Harbor, July, 1898; an old Russian blast alcohol lamp; an ancient stone retort; the first registration book of Philadelphia druggists, before the State registration act was passed; a complete set of all editions of Remington's "Practice of Pharmacy;" a complete set of the AMERICAN JOURNAL OF PHARMACY, from 1825 to 1916, and original manuscripts and prints used in contributed articles; a complete set of all editions of Kraemer's works on Botany and Pharmacognosy; a bottle of wine made in 1864 by Prof. William Procter; a book of labels of William Procter Jr. Company, Ninth and Lombard Streets, Philadelphia; a model of a Norwegian fishing smack as used in cod fishing; an upright condenser belonging to Prof. Israel J. Graham; a bandage wrapping machine and convalescent feeding bowl as used during the Civil War; a collection of wooden mortars and pestles from Cuba; the first stick of phosphorus made in America and the first specimen of glycerin made in Philadelphia.

Needless to say, all of these very interesting objects attracted favorable attention. The beautiful penmanship shown in the register of Philadelphia druggists mentioned above was the cause of much comment and many visitors deplored the passing of the day when handwriting was still intelligible.

STUDENT ACTIVITIES PORTRAYED.

To the present student of pharmacy at the Philadelphia College and to many former students, one of the most fascinating portions of the exhibit was that devoted to recording student activities. There was the " baseball bat of victory " which had seen yeoman service in winning athletic laurels for the blue and white. Pictures of the winning football, baseball and track teams—they are never losing teams—were scattered about. Fraternity and class banquet menus and reception programmes were there in considerable quantity and dating back many years. Then there were those great storehouses of information regarding P. C. P. student life—the volumes of " The Graduate." Christopher Koch, Jr., of the Class of 1899, more than anyone else perhaps, was responsible for the first issue of a class record, and like the initial volume of 1899, edited by Koch, all of its successors have been creditable to the institution and the men which they represent.

A set of students' Weekly Bulletins which were issued for two years also recorded in detail the many things of a social and educational nature which make college life so well worth while.

Bound volumes of the Alumni Report issued monthly until July, 1908, when it was discontinued and superseded by the quarterly Alumni Bulletin, were also on exhibition and many interesting bits of P. C. P. history are contained in its pages.

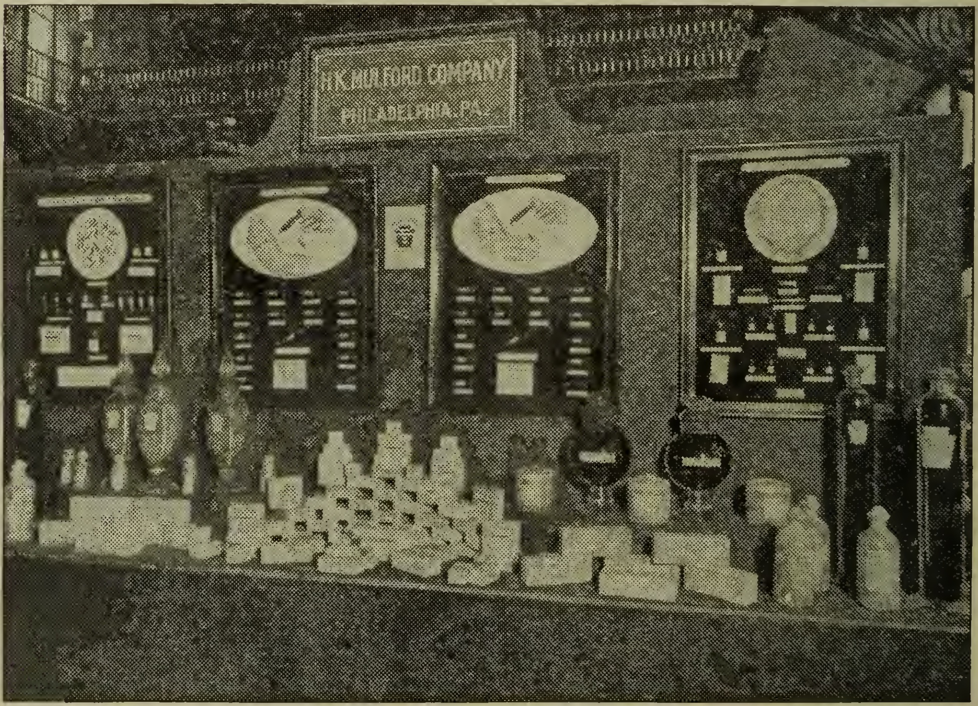
PHARMACEUTICAL MANUFACTURERS' EXHIBITS.

No pharmaceutical exhibit is complete to-day without a section devoted to manufacturing pharmacy and the exhibit under discussion did not omit this important sphere of pharmaceutical activity. It is interesting to note that the fiftieth anniversary of the P. C. P. Alumni Association synchronizes with the fiftieth anniversary of Parke, Davis & Co., of Detroit, Michigan; the fortieth anniversary of Eli Lilly & Co., of Indianapolis, and the twenty-fifth anniversary of the H. K. Mulford Co., of Philadelphia. It is also very interesting to record that the heads of these three great manufacturing concerns are graduates of the Philadelphia College of Pharmacy.

Eli Lilly & Co. showed a sample of atropine made from wild-growing stramonium with the use of Lloyd's reagent and other pharmaceutical products.

The H. K. Mulford Co. had biological and pharmaceutical products on display in addition to the completely equipped Mulford biological refrigerator, which was a part of the fixtures of the "model" pharmacy. Display cases showing bacterins, serobacterins, antitoxins, vaccines, etc., were a part of the biological exhibit and an attractive line of galenicals was shown in the pharmaceutical exhibit of this concern. However, the portion of the Mulford display which attracted greatest attention was the complete laboratory for biological assaying of drugs that had been fitted up in one corner of the large Museum. All necessary apparatus for blood pressure experiments were shown, including the lately devised Pittenger Multiple Operating Table and Kymograph Case, which is capable of accommodating four dogs at one time for testing purposes. The

Fig. 5



Some Mulford Biological and Pharmaceutical Products Exhibited at the Philadelphia College of Pharmacy.

apparatus used in standardizing pituitary extract by the isolated uterus method was also on view. A number of carefully prepared charts had been suspended in conspicuous places to illustrate the necessity for physiological assays and the methods of carrying them out.

One chart showed the results of an investigation of the digitalis preparations on the market, the variation in strength ranging from 1 to 300 per cent. of normal, thus emphasizing the necessity of fixing and maintaining standards, so as to insure uniformity of action of drugs. In view of the fact that the new Pharmacopœia has recommended biological assays for a number of drugs and requires that cannabis be standardized by physiological methods, this display was particularly interesting and timely.

Some of Burroughs-Wellcome Company's scientific literature and preparations gotten up in a most attractive form were on view and their exhibit was the only one consisting of pharmaceutical products manufactured in England. Both Burroughs and Wellcome graduated from the Philadelphia College of Pharmacy and later went to England where they have since built up a large manufacturing business.

The progress of chemistry, particularly as it relates to pharmacy was in a measure depicted by the displays of Powers, Weightman, Rosengarten Co.; Keasby and Mattison and A. Klipstein & Co.

Chemical Manufacturers' Exhibits.

Powers, Weightman and Rosengarten have been well known for nearly a century as manufacturers of high-class chemicals for medicinal and technical use. They inaugurated a novel departure from the usual type of exhibit by showing not only finished chemicals but the crude materials from which they are made. For example, there were samples of gum opium and morphine and codeine derived therefrom. There were samples of cinchona bark and its alkaloid quinine; nutgalls and tannic acid; magnesite and heavy magnesium oxide; iodine (crude) and iodine resublimed, etc.

Powers & Weightman and Rosengarten & Sons, the two firms which later united to form the present company of Powers, Weightman & Rosengarten, introduced into this country the manufacture of quinine and morphine sulphates, and this firm to-day is one of the largest makers of these products in the world. Not less important is the relation of this company to the manufacture of many other staple chemicals, such for example as citric acid, bismuth subnitrate, strychnine and ether for anæsthesia, samples of which were also included in the display. A comprehensive list of other medicinal and technical chemicals are also manufactured by this firm as shown by their catalogue at the exhibit.

The collection of magnesia products displayed by Keasby and Mattison of Ambler, Pa., was also very interesting. Their magma magnesium oxide for the quick preparation of milk of magnesia was shown as were also numerous forms of asbestos for which this firm is particularly well known. Hynson, Westcott and Dunning had some of their specialties on exhibition and Dodge & Olcott had a display of volatile oils in the various types of containers used in commerce. A huge block of sandalwood on the table with these oils was viewed with interest by the many visitors.

MISCELLANEOUS SUPPLIES AND THOSE WHO FURNISHED THEM.

While mentioning the various exhibitors of manufactured products it is well to call attention to the other concerns who helped to make this exhibit a success. In the equipment of the model pharmacy the telephone booth was loaned by the Bell Telephone Co. The mahogany fixtures were provided by Smith, Kline & French Company. The merchandise in the store was loaned by George B. Evans, while the office fixtures were obtained for the occasion from A. Pomerantz Company. The Burroughs Adding Machine Company furnished the adding machine for the office and L. C. Smith Brothers Typewriter Company loaned the combination label and letter machine.

Arthur H. Thomas provided the chemical, bacteriological and other scientific apparatus for equipping the analytical laboratory and most of the pharmaceutical glassware and shop furniture was loaned by Whitall-Tatum Company. Prescription balances and scales were furnished by Henry Troemner and the Torsion Balance Company. The F. J. Stokes Machine Company loaned a hand tablet machine and an automatic water still. Wrapping paper was obtained from D. L. Ward Company, and the United Gas Improvement Company provided the store with modern gas lighting fixtures.

It is a difficult matter to describe an exhibit covering as great a field as this one included, in limited space and do full justice to each individual portion of it. Our object has been to give a general survey, calling particular attention to some of the outstanding features.

We could say considerably more without touching, perhaps, on some particular phases of the exhibit which may have appealed most strongly to some visitors and yet we dare say that some of the things here described were not noticed by many of those who saw the exhibit. All of which merely goes to show that in order to fully appreciate an exhibition of this kind, from the personal standpoint, it must be seen. The writer was fortunate in securing the coöperation of his faculty colleagues, when he was asked to prepare this account. He is indebted to Prof. LaWall for the detailed account of the Glentworth store and other data. Professors Kraemer, Cook, Lowe, Moerk and Stroup pointed out the particular features which had been emphasized in connection with the exhibits of their respective departments, and President Howard B. French furnished some interesting details particularly with regard to the Glentworth store. The committees on exhibit of the Board of Trustees and Alumni Association cannot be too highly commended for their splendid work.

COMMITTEE.

The original committee on the 50th Anniversary Celebration of the Alumni Association of the Philadelphia College of Pharmacy consisted of a joint committee of the Board of Trustees and the Alumni Association. The committee of the Board of Trustees consisted of President Howard B. French, Chairman; Mr. W. L. Cliffe, Professor Joseph P. Remington, Mr. Walter A. Rumsey, and Mr. Joseph W. England. The committee of the Alumni Association was made up of Professor Henry Kraemer, Chairman; Professor F. P. Stroup, Mr. Warren H. Poley, Mr. Otto Kraus, and Dr. Mitchell Bernstein. The membership of the joint committee was increased by the addition of the following: Professor E. Fullerton Cook, Mr. C. Mahlon Kline, Mr. James A. Garvey, Mr. John R. Graham, Professor Charles H. LaWall, Mr. Ivor Griffith, Mr. George B. Evans, Mr. Walter V. Smith, Hon. Theodore Campbell, Mr. Charles Rehfuss, and Dr. P. Samuel Stout. The work was subsequently divided into two principal committees, the one on Exhibition of which Professor E. Fullerton Cook was Chairman, and the other on Dinner of which Mr. Otto Kraus was Chairman.

That this exhibit will go down in the history of the Philadelphia College Alumni Association as one of its greatest achievements is certain, and in the years to come it will be referred to as having commemorated three things: First, the fiftieth anniversary of the Alumni Association; secondly, the beginning of a new era in the practice of pharmacy, and thirdly, the beginning of a greater Philadelphia College of Pharmacy as a result of the enlarged faculty, student body and alumni association, due to the recent merger with the department of pharmacy of the Medico-Chirurgical College.

The same spirit of altruism and fair play which prompted President French and the Board of Trustees of the College to receive the faculty and student body of the pharmacy school of the Medico-Chirurgical College with open arms, has brought about a merger of the two alumni associations. And the Alumni Association of the Philadelphia College of Pharmacy thus fortified enters its second half century with supreme confidence in its own future, the future of pharmacy and the future of its Alma Mater.

SOME CONSTITUENTS OF SUMBUL ROOT.[1]

By Frederick W. Heyl and Merrill C. Hart.

Since the root of *Ferula Sumbul* is an officially recognized drug of the United States Pharmacopœia, and has for some years been used as an antispasmodic, it was deemed of interest to subject the root to a more complete chemical investigation. Our present knowledge of its constituents is fairly summarized in the United States Dispensatory,[2] where it is stated that the root contains a volatile oil, two balsamic resins, wax, gum, starch, a bitter substance, fat (17 per cent.), angelic and valeric acids. Knitl,[3] with Tschirch, isolated umbelliferon. Cushny [4] classifies sumbul with valerian, basing the similarity upon the presence of malodorous volatile oils, which may act psychically and physiologically. Since the oil of sumbul, in consequence of the study of the other constituents reported in this paper, appears to be important in this connection, we shall report upon it later.

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[1] Reprinted from the *Journal of the American Chemical Society*, vol. xxxviii, No. 2, February, 1916.

[2] U. S. Dispensatory, 19th Ed., 1209.

[3] *Archiv. Pharm.*, 237, 270 (1899).

[4] "Pharmacology and Therapeutics," 73 (1906).

It is generally stated that the musk root now upon the pharmaceutical market in the United States is not true *Ferula Sumbul;* but that in its place we have the dried rhizome and root of an undetermined umbelliferous plant, which enters commerce from Central and Northern Asia, through the Moscow drug market. Our sample consisted of the unsliced root imported from Moscow. Further than this it was impossible to trace its origin. The root was of a quality which is now considered official.

The proximate analysis shows that the air-dried root contained 10.2 per cent. moisture and 6.5 per cent. ash. Ligroin extracted, 11.8 per cent.; ether, 14.6 per cent.; and alcohol, 27.4 per cent. The residue insoluble in alcohol had the following composition: crude fibre, 17.5 per cent.; pentosans, 10.6 per cent.; protein, 5.4 per cent.; starch, 7.7 per cent.; dextrin, 1.4 per cent. The alcoholic extract, which contains the substances entering into pharmaceutical preparations, showed the presence of 1.7 per cent. sucrose, approximately 1.0 per cent. lævulose, and the resin after hot extraction amounts to 18.7 per cent. There is a very considerable discrepancy in the extractive matter removed by alcohol, depending upon the temperature. Whereas boiling 95 per cent. alcohol extracted 27.4 per cent. of sumbul root, the cold percolation, which was exhaustively completed, extracted only about 20 per cent., and about 17.3 per cent. was precipitated by the addition of water.

The products present in the alcoholic solution (obtained by cold percolation) and soluble in water, besides the sugars above mentioned, are acetic acid, a glucoside of umbelliferon, and betaine.

The resin insoluble in water, which forms the most conspicuous portion of this drug, was extracted successively with ligroin, ether, chloroform, ethyl acetate, and alcohol.

The ligroin extract consisted to the extent of about 17 per cent. of resinous material other than fat. This product was a white acid resin, soluble in one per cent. potassium hydroxide, and yielded upon hydrolysis vanillic acid and an oil resembling the volatile oil. The fat yielded a large amount of indefinite unsaponifiable material, of which one fraction showed a constant boiling point at 168–173° at 12 mm. and upon analysis gave values indicating the formula $C_8H_{13}O$. The unsaponifiable matter further yielded a phytosterol, $C_{27}H_{46}O$, melting at 134–135°. The corresponding acetate melts at 121–122°. The following fatty acids were identified: acetic, butyric, valerianic, tiglic, angelic, oleic, linoleic, cerotic, palmitic and stearic acids.

The ether extract of the resin yielded a phytosterolin, $C_{33}H_{56}O_6$, melting at 290°. It formed an acetate that melted at 159–160°. A trace of vanillin was indicated by color tests. The ether extract consists of neutral resinous (42 per cent.) and acidic resinous (52 per cent.) constituents. The former proved to be an ester, and yielded umbelliferon and therefore belongs with the group that includes galbanum, sagapen and asafœtida. The acidic resin could be prepared as an almost white powder, but fractional extraction indicated this to be a mixture of resin acids. These acids upon hydrolysis yield both vanillic acid and umbelliferon.

The chloroform extract of the resin consisted largely of a resinous glucosidic substance. It yielded umbelliferon and glucose upon hydrolysis.

The product extracted from the resin with ethyl acetate was not glucosidic but umbelliferon was prepared from it after hydrolysis.

The alcoholic extract of the resin also yielded umbelliferon and a reducing sugar upon hydrolysis.

EXPERIMENTAL.

A. Proximate Analysis (By Mr. J. F. Staley).—A sample of the air-dried root after grinding and sieving was quantitatively extracted with various solvents and the following results were obtained:

Extract	Per cent.
Ligroin (35–55°)	11.72, 11.83
Ether (110°)	14.66, 14.55
Volatile ether extract	(see below, volatile oil)
Alcoholic	27.6, 27.14

The proximate analyses were conducted in accordance with the usual methods[5] and gave the results tabulated below:

	Per cent.		Per cent.
Moisture	10.17	Protein	5.5, 5.3
Starch (diastase)	7.7	Ash	6.5, 6.4
Pentosans	10.6	Dextrin	1.4
Crude fibre	17.15, 17.6		

A determination of the alcohol soluble carbohydrates was carried out by completely extracting 100 g. of the root with boiling neutral alcohol. The combined alcoholic extracts were concentrated under diminished pressure to a small volume, and enough water was added to completely precipitate the resin. This mixture was shaken repeatedly with ether in the volumetric flask, in order to remove as much of the resin as possible. The ether was removed with a pipet. The last traces of ether were removed by passing a current of air through the solution, which was thereupon precipitated with an excess of basic lead acetate solution and made up to a volume of 200 Cc. This solution was filtered and the filtrate showed a rotation of –1.78° V, at 20° in a 2 dcm. tube. Lead was removed from the solution and 12.5 Cc. were inverted by permitting it to stand in the presence of hydrochloric acid for 24 hours. The solution was neutralized and made up to a volume of 50 Cc. This showed a rotation of –0.6° in a 2 dcm. tube. The percentage of sucrose calculated by Clerget's formula is 1.64 per cent. It is further indicated that the reducing sugar is lævulose in an amount of approximately 0.51 per cent. Gravimetric estimation of the sugars by the Munson and Walker modification of Fehling's process gave 1.87 per cent. sucrose and 1.0 per cent of reducing sugar.

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[5] U. S. Dept. Arg., Bur. of Chem., Bul. 107 (revised).

Sumbul root was examined for the presence of alkaloids by extracting a 200 g. sample with Prolius's solution but with negative results.

Volatile oil was determined, first by steam distilling one kilo of the coarsely ground drug for a few hours. The yield was 6.8 g. oil corresponding to 0.68 per cent. When a 500 g. sample of finely sieved material was distilled for several days 5.51 g. of oil (1.1 per cent.) was obtained.

The oil on standing deposited a few yellow crystals that melted at 113–114° but these were not identified. The oil had a specific gravity of 0.932 at 15°. Upon distillation the higher fractions turned dark blue in color. A qualitative test for sulphur was negative.

B. Complete Examination of Alcoholic Extract.—For this purpose 56.7 kg. were exhausted by percolation with cold 95 per cent. alcohol. The percolate (327 l.) was concentrated under diminished pressure to a volume of 15.7 litres (1 l. = 3.6 kg. sumbul root).

Two litres of this extract were poured into 8 litres of distilled water and vigorously shaken. A heavy, sticky, viscous, light brown, semi-liquid separated. After standing 24 hours the aqueous layer was decanted, and the resin was washed with a second addition of distilled water. The resin weighed 1231 g. = 17.1 per cent. A second 2-litre portion gave 1251 g. A third lot was precipitated and the resin fraction on the one hand, and the fraction representing the water-soluble constituents on the other, were studied separately.

The Examination of the Water-Soluble Constituents.—This solution (30 litres) contained the water-soluble constituents from 6 litres of the alcoholic extract representing 21.6 kg. of the root. It contained 520 g. of material and was concentrated to a volume of 3 litres under reduced pressure. The distillate obtained was distinctly acid. It was therefore rendered alkaline with barium hydroxide and concentrated to a small volume, again rendered acid and steam distilled. Acetic acid was identified as the silver salt.

Calc. for $C_2H_3O_2Ag$: Ag=64.6. Found: 64.1 per cent.

The concentrated solution was extracted repeatedly with large volumes of ether. The ethereal solution, which contained 46 g. of material, was concentrated to a small volume and fractionally extracted with solutions of hydrochloric acid (10 per cent.), water, ammonium carbonate, sodium carbonate, and potassium hydroxide successively. Nothing definite was isolated from these fractions, although the sodium carbonate fraction upon acidification yielded slight amounts of crystalline material.

The aqueous solution, which had been completely extracted, was extracted with chloroform, which removed 13 g. of dark, oily material, from which nothing of a crystalline nature could be obtained. The aqueous layer, after the above-mentioned ether and chloroform extractions, was repeatedly shaken with hot amyl alcohol. The combined amyl alcoholic extracts were concentrated and washed repeatedly with water until free from reducing sugar. Upon further concentration of the amyl alcoholic extracts several crops of brown amorphous hygroscopic material separated. These could not be crystallized. The amyl alcohol was completely removed. Altogether 122 g. of material were present in this fraction, but its dark-colored, varnish-like nature prevented crystallization even after prolonged standing. For acid hydrolysis 42 g. were digested for two hours with 5 per cent. dilute alcoholic sulphuric acid. Upon removal of the alcohol, a smear separated. Water was added and the whole subjected to a steam distillation. The oily distillate which had an odor resembling furfuraldehyde failed to give the furfuraldehyde test. When the contents of the flask which had been steam-distilled had cooled a black resin separated, in which were admixed wart-like aggregates of crystalline material. The resin was therefore repeatedly extracted with boiling water. This was facilitated by blowing steam through the mixture. Altogether 2.9 g. of crystalline material separated from these watery extractions. The product was crystallized from dilute alcohol and from hot water. It separated in beautiful star-like aggregates of fine needles, melting at 227°. These crystals gave a blue fluorescence in alkaline solution. They were identified as umbelliferon.

Calc. for $C_9H_6O_3$: C, 66.67; H, 3.7. Found: C, 66.63; H, 3.9.

The black resin was dissolved in alcohol, poured upon purified sawdust and extracted with various solvents, but no crystalline compounds were isolated from it.

The combined acid aqueous liquid, from which umbelliferon had crystallized, was concentrated to a small volume and extracted with ether, which dissolved a further quantity of umbelliferon. The sulphuric acid was quantitatively removed from the aqueous solution, from which *d*-phenyl glucosazone melting at 204–205° was prepared. No pentose sugar was present. The quantity of reducing sugar present was equivalent to 11.27 g. glucose.

One of the products extracted by amyl alcohol is therefore distinctly shown to be glucosidic in nature, and is undoubtedly a body similar to or isomeric with the glucoside of *Skimmia japonica.*[6]

The aqueous liquid which had been extracted with ether and with amyl alcohol was freed from the latter immiscible solvent by means of a vigorous steam distillation. The total volume at this point was 10 litres.

The distribution of nitrogen in this solution was as follows: Total soluble nitrogen, 3.8 g. or 0.017 per cent.; ammonia nitrogen, 1.23 g. or 0.0057 per cent.; lead subacetate precipitable nitrogen, 1.31 g. or 0.0068 per cent.; nitrogen precipitated with phosphotungstic acid, 0.463 g. or 0.0021 per cent.

In order to test for acid amides such as asparagine and glutamine, one-fifth of the solution was precipitated with mercuric acetate solution, but only a very slight separation took place. Its subsequent examinations for asparagine, glutamine, and allantoine were negative.

The remaining four-fifths was completely precipitated with basic lead acetate, whereupon a precipitate separated. This was removed by filtration and decomposed with hydrogen sulphide in the usual manner. The material precipitated with lead subacetate weighed but six grammes. The usual tests for tannin were negative. It was mixed with purified sawdust and extracted with various solvents but this led to no pure products. An alkaline hydrolysis yielded no definite compounds.

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[6] Eykman, *Receul trav. chim. pays-bas.*, 1884, p. 204.

The filtrate from the lead subacetate precipitate was freed from the excess of lead with hydrogen sulphide and after filtering off the lead sulphide, the filtrate was concentrated to a syrup. A small portion of this syrup, which has been shown to contain lævulose and sucrose, yielded a heavy crystalline deposit of pure *d*-phenylglucosazone which melted and decomposed at 210–211°. Pentose sugars were absent.

The remainder of this solution was precipitated with an excess of phosphotungstic acid in the presence of 5 per cent. sulphuric acid, and the resulting precipitate was removed by filtration, washed with 5 per cent. phosphotungstic acid wash and decomposed by the method of Wechsler.[7]

The solution of the basic products was made up to a volume of 500 Cc.

25 Cc. distilled with MgO yielded no ammonia.
25 Cc. required by the Kjeldahl method 12.58 Cc. 0.1 *N* acid.

The remainder of the solution of basic products was concentrated to a syrup at 33°. This was extracted with 150 Cc. of absolute alcohol and filtered. The alcohol was removed, and upon again treating the residue with absolute alcohol an amorphous hygroscopic solid separated. The filtrate from this now proved to be freely soluble in absolute alcohol and upon the addition of concentrated hydrochloric acid crystals consisting chiefly of betaine hydrochloride separated. The yield amounted to 0.5 g. or 0.019 per cent. These crystals were not quite homogeneous. After several crystallizations from alcohol the melting point was about 229–232°. Some parts of the crystalline mass which had the typical appearance of betaine hydrochloride could be picked out, and after rinsing with absolute alcohol the melting point found was 235°. The chlorine determination also indicated the presence of another base.

Calc. for $C_5H_{11}O_2N.HCl$: Cl, 23.1 per cent. Found: Cl, 24.5 per cent.

Pure betaine was identified after a fractional crystallization as the gold salt.

Calc. for $C_5H_{12}O_2N.AuCl_4$: Au, 43.1 per cent. Found: Au, 43.2 per cent.

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[7] *Z physiol. Chem.*, 73, 138 (1911).

Cholin was absent. A fractional crystallization of the mercuric chlorides failed to indicate any separations. The most insoluble fraction of the mercuri-chlorides when decomposed with hydrogen sulphide, and converted into the corresponding gold salt, yielded a very pure sample of betaine aurichloride melting at 246–247° and containing 43.1 per cent. gold. The melting point of the following fraction was 239–240° and it contained 42.7 per cent. gold. The base here is chiefly betaine, but another substance is also present in the fraction.

The Examination of the Resin.—The resin precipitated when the alcoholic extract was poured into water weighed about 3.7 kg. This in alcoholic solution was poured upon purified sawdust, after it had been ascertained that nothing crystalline could be directly separated from it. A suitable quantity of the dried impregnated sawdust was transferred to a continuous extractor and extracted with the following results:

Petroleum ether (40–60°)	357 g.
Ether	316
Chloroform	46
Ethyl acetate	19
Alcohol	18
Total	756 g.

The Ligroin Extract.—This extract amounted to 357 g. It was dissolved in 2 litres of ether and then extracted with solutions of hydrochloric acid, water, and ammonium carbonate. None of these extractions yielded definite products. The ethereal solution was now shaken with a solution of potassium carbonate, whereupon an emulsion formed. The mixture was acidified and then a clear ethereal solution was recovered which was successfully extracted with a ten per cent. solution of potassium hydroxide. The combined potassium hydroxide extractions were acidified and extracted with ether, and from this ethereal solution the substances soluble in aqueous potassium carbonate solution could now be extracted, leaving at length an ethereal solution containing 62 g. The constituents of the ether solution which were soluble in potassium carbonate solution were again extracted with ether after acidifying the solution of the potassium salts. The solution was dried over anhydrous sodium sulphate and the ether removed. The residue, which weighed 32 g., was distilled under diminished pressure. The boiling point was 234–275° at 28 mm. and it had an iodine number of 101.3. These fatty acids were studied in connection with those obtained upon the subsequent hydrolysis of the glycerides.

The material soluble in potassium hydroxide solution was almost entirely removed from its ether solution by fractional extraction with one per cent. potassium hydroxide solution. Upon acidification this resin could be obtained as a brittle solid. It yielded the same products when hydrolyzed in acid and in alkaline alcoholic solution. The acid hydrolysis, however, was more satisfactory, and after heating for many hours with 5 per cent. alcoholic sulphuric acid the alcohol was removed by steam distillation.

The steam distillate yielded a small quantity of an oil resembling the volatile oil of sumbul. The fraction boiling below 230° was colorless while the fraction boiling at 230–250° was dark blue in color.

The black resinous hydrolysis products contained in the flask were extracted with ether. The ether was extracted with solutions of ammonium carbonate, potassium carbonate, and potassium hydroxide. From the ammonium carbonate extract, vanillic acid was obtained. It melted at 206.5 to 207.5°. It was dried at 125° and analyzed.

Calc. for $C_8H_8O_4$: C, 57.1 ; H, 4.8. Found : C, 57.1 ; H, 4.7.

The methyl ester, prepared in the usual manner, melted at 62–63°.

The potassium carbonate extraction showed a blue fluorescence, but nothing could be obtained from it. The potassium hydroxide solution removed most of the hydrolytic products. These were recovered and again hydrolyzed with a further quantity of 5 per cent. alcoholic sulphuric acid, but no further yield of vanillic acid was obtained. The material soluble in potassium hydroxide solution was fractionally distilled at a pressure of 17 mm. Five fractions were obtained: (I) up to 150°, (II) 150–170°, (III) 170–205°, (IV) 205–212°, (V) above 212°. Fractions I, II, III were solids from which a considerable quantity of vanillic acid (206–207°) was isolated. The upper fractions were amber-colored oils that solidified. They resemble somewhat the higher boiling fractions obtained in the unsaponifiable fraction of the fat.

The original ethereal solution which had been extracted as described above was evaporated to dryness and the residue of neutral substances was saponified by boiling with 700 Cc. of ten per cent. alcoholic potash for about seven hours. The alcohol was removed and water added in sufficient quantity to completely precipitate the unsaponifiable material. This was extracted with ether.

Examination of the Unsaponifiable Matter.—The dried solution was evaporated to dryness and the residue proved to be an oil which could not be directly crystallized. The material was divided into two equal parts and fractionally distilled under diminished pressure. The results upon the first half were as follows:

Fraction I. (B. p. 100–174° at 27–24 mm.) This was a yellowish limpid oil with a somewhat fragrant odor and amounted to about 7 g.

Fraction II. (B. p. 174–190° at 25 mm.) This is an olive-green oil amounting to about 11 g. The viscosity seemed to increase noticeably and the fraction was therefore stopped at 190°.

Fraction III. (B. p. 190–205° at 28 mm.) This was a thick olive-green oil amounting to about 14 g.

Fraction IV. (Up to 267° at 30 mm.) This is a thick viscid fraction which did not solidify and weighed about 23 g.

Fraction V. (B. p. 290–360° at 17 mm.) This weighed 4.4 g and partially solidified.

The other half of the unsaponifiable material was distilled in approximately the same manner and the light, limpid fragrant oils which constitute the lower boiling fractions were fractionally distilled several times.

The fractions were as follows:

Fraction I. (Up to 140° at 15 mm.) This fraction had no sharp boiling point, as some of the material boiled at 80°. It is a very mobile yellow oil.

0.1807 g. absorbed 0.301 g. iodine; iodine number, 166.6. 0.1902 g. subst gave 0.1815 g. H_2O and 0.5564 g. CO_2. Found: $C = 79.8$; $H = 10.7$.

Fraction II. (B. p. 140–170° at 18 mm.) This is a yellow oil, slightly less mobile than Fraction I. It was rather fragrant and was unsaturated.

Fraction III. (B. p. 175–180° at 15 mm.) This fraction appeared to possess an almost constant boiling point. It was redistilled and most of it passed over at 168–173° at 12 mm. It was light green in color and not more than slightly mobile unless warmed. The specific gravity at 15° was 1.0052 and $[\alpha]_D$ was −17.41°.

2.3353 g. made up to 20 Cc. with chloroform showed a rotation of −4.06° in a 2 dcm. tube.

0.1393 g. subst. absorbed 0.2432 g. iodine; iodine number, 174.6. 0.1982 g. subst. gave 0.1482 g. H_2O and 0.5596 g. CO_2. Calc. for $C_8H_{13}O$: $C = 76.75$; $H = 10.5$. Found: $C = 77.0$; $H = 10.4$.

The other fractions boiling above 180° and below 270° were thick viscid oils and seemed similar to the material which usually accompanies the phytosterols in this fraction, but the amount present in sumbul root is unusually large. It amounted to about one-half of the entire fraction.

The highest boiling fraction yielded, when crystallized from ethylacetate, 2.0 g. of a phytosterol melting at 134–135°.

Calc. for $C_{27}H_{46}O.H_2O$: $H_2O = 4.5$. Found: 4.97.
Calc. for $C_{27}H_{46}O$: $C = 83.9$; $H = 11.9$. Found: $C = 84.0$; $H = 12.1$.

0.4786 g. anhydrous material made up to 20 Cc. with chloroform showed a rotation of 1.42° in a 2 dcm. tube, whence $[\alpha]_D^{20} = -29.7°$.

It yielded an acetyl derivative, that separated from acetic anhydride in thin, elongated plates terminating in an angle at one end, and melting at 121–122°. When recrystallized from ethyl acetate the melting point was unchanged. The filtrate from which this 2 g. of phytosterol separated yielded upon concentration 1.3 g. further. Recrystallized once it melted at 133–134° and yielded an acetate identical in appearance with the one just described. The melting point of the acetate separating from acetic anhydride was 118–120° which was elevated to 120–121° by one recrystallization.

Examination of the Volatile Fatty Acids.—The alkaline solution from which the unsaponifiable matter had been extracted with ether was divided into two equal parts, each of which, after acidification with dilute sulphuric acid, was steam distilled for eight hours. The odor of the distillate resembles that of infusion of hops. The combined distillate was almost neutralized with 656 Cc. of 0.41 *N*, barium hydroxide solution. This was concentrated under diminished pressure to a volume of 200 Cc. and acidified with hydrochloric acid, whereupon a quantity of oil separated which was extracted with ether. The solution was dried over anhydrous sodium sulphate and the ether removed. The residue, weighing about 17 g. was fractionally distilled at atmospheric pressure. The distillate was caught in three fractions: (I) up to 157°; (II) 157–190° (62.2 g.); (III) 190–200° (9.5 g.). The third fraction, when allowed to stand in the ice chest, yielded a crop of beautiful crystals of tiglic acid melting at 61°. The fractions above recorded were now subjected to a systematic fractional distillation and five fractions were obtained.

Fraction I. (B. p. up to 125°.) This fraction was neutralized with ammonium hydroxide, concentrated in order to remove the excess of ammonia and treated with silver nitrate solution. It contained a small quantity of acetic acid as was shown by the analysis of the silver salt that separated.

0.1171 g. gave 0.0717 g. silver. Calc. for $C_2H_3O_2Ag$: Ag = 64.6 per cent Found: 61.2 per cent.

Fraction II. (B. p. 125–165°.) This was an intermediate fraction, amounting to about 3 g. It had the odor of acetic acid combined with that of valerianic or butyric acid.

0.1331 g. gave 0.1050 g. H_2O and 0.2377 g. CO_2. Found: C = 48.7; H = 8.85. Calc. for $C_2H_4O_2$: C = 40.0; H = 6.7 per cent.; for $C_4H_8O_2$: C = 54.5; H = 9.1 per cent.; for $C_5H_{10}O_2$: C = 58.8; H = 9.8 per cent.; for $C_5H_8O_2$: C = 60.0; H = 8.0 per cent.

The analytical data indicates a mixture of butyric and acetic acids.

Fraction III. (B. p. 165–180°.) This fraction had the odor of butyric and valerianic acids. When dissolved in aqueous solution of sodium carbonate it instantly reduced potassium permanganate solution in the cold and it therefore contained a quantity of unsaturated acid.

0.2152 g. gave 0.1549 g. H_2O, and 0.4308 g. CO_2. C = 54.6; H = 8.1.

This fraction consists essentially of butyric and angelic acids.

Fraction IV. (B. p. 180–190°.) C = 59.7; H = 8.33. This fraction was converted into the silver salts which had a constant composition.

Calc. for $C_4H_7O_2Ag$: Ag = 55.4; for $C_5H_9O_2Ag$: Ag = 51.7; for $C_5H_7O_2Ag$: Ag = 52.2. Found: I, Ag = 52.1; II, Ag = 52.0.

Fraction V. (B. p. 190–195°.) C = 59.8; H = 8.1.

These fractions are mixtures of angelic and tiglic acids. The solid acid, which was repeatedly separated by freezing the high boiling fraction, melted at 62–63°, and when analyzed gave results agreeing with those required by tiglic acid.

Calc. for $C_5H_8O_2$: C = 60.0; H = 8.0. Found: C = 60.1, H = 8.1.

The aqueous liquid from which the above-described acids had been extracted with ether was again steam distilled and yielded a crop of crystals of almost pure silver acetate.

Calc. for $C_2H_3O_2Ag$: Ag = 64.6. Found: Ag = 64.1 per cent.

Examination of the Non-volatile Fatty Acids.—The acid mixture which had been steam distilled for the removal of the fatty acids was cooled and extracted with ether. From the dried solution the ether was removed and the residue digested with a large volume of low boiling petroleum ether. A considerable quantity of a sticky, brown smear proved to be insoluble. The petroleum ether was removed and the fatty acids distilled. They had an iodine number of 121, and boiled chiefly at 230–260° at 15 mm. However, a considerable quantity came over at lower temperatures, showing that the steam distillation had not completely removed the lower acids. The first distillate crystallized upon cooling and proved to be tiglic acid melting at 63–64°. Furthermore, a fraction boiling above 260° was caught. The weight of these acids was 19.2 g.

This was mixed with the acids which had been originally extracted with potassium carbonate solution. Of this mixture a portion weighing 22.4 g. was separated into the solid and liquid acids. The latter weighed 16 g., thus constituting about 71 per cent. of the fatty acids. These boiled chiefly at 215–245° at 15 mm., although they seemed to contain a trace of the lower acids.

Calc. for $C_{18}H_{34}O_2$: C = 76.6; H = 12.1; iodine no. = 90.1; for $C_{18}H_{32}O_2$: C = 77.1; H = 11.4; iodine no. = 181.4; for $C_{18}H_{30}O_2$: C = 77.7; H = 10.8; iodine no. = 274.0. Found: C = 77.3; H = 11.2; iodine no. = 138.7.

The liquid acids therefore consist of oleic and linoleic acids with perhaps a small quantity of tiglic acid.

The solid acids weighed 4.1 g. A quantity of cerotic acid equivalent to 33 per cent. of the solid acids was obtained. It melted at 74–75°.

Calc. for $C_{26}H_{52}O_2$: C = 78.8; H = 13.1; N. V. = 141.7. Found: C = 78.4; H = 13.0. N. V. = 140.7.

The alcoholic filtrate from the cerotic acid yielded a quantity of a mixture of palmitic and stearic acids melting at 52–53°.

Calc. for $C_{16}H_{32}O_2$: C = 75.0; H = 12.5; N. V. = 219.1; for $C_{17}H_{36}O_2$: C = 76.1; H = 12.7; N. V. = 197.5. Found: C = 75.6; H = 12.5; N. V. = 205.3.

The Ether Extract of the Resin, which amounted to 316 g., was obtained in two extractions of the sawdust which had been impregnated with the resin, as above described. The first extract amounting to 300 g. was very soluble, while the second ether extract (16 g.) was obtained by prolonged extraction and upon standing tended to separate as a tar.

The first extract was concentrated and after prolonged standing a small quantity of a white micro-crystalline product separated. When this substance was dissolved in chloroform, in the presence of a few drops of acetic anhydride, and sulphuric acid was added a play of colors resulted showing at first transient pink, then blue, and finally a beautiful green. It melted at 260–270°, and after crystallization from dilute pyridine it melted at about 290°. It was a phytosterolin.

Calc. for $C_{33}H_{56}O_6$: C = 72.3; H = 10.2. Found: C = 72.6; H = 10.2.

A small portion was converted into an acetate, which crystallized from a mixture of dilute alcohol and ethyl acetate in beautiful plates, melted at 59–160°.

A portion of the ethereal filtrate from the above-mentioned phytosterolin was shaken with a 30 per cent. sodium bisulphite solution. The aqueous solution was drawn off, acidified with H_2SO_4 and allowed to stand until the sulphur dioxide had been dissipated. The solution now had an aromatic fragrance. It was extracted with ether. The ether solution showed a residue of an insignificant amount of oil. This was subjected to the color tests characteristic for vanillin. With ferric chloride a green color resulted, similar to the color resulting with dilute vanillin solutions. The phloroglucin and hydrochloric acid test showed a light pink coloration. It is therefore quite probable that this resin contains a trace of vanillin.

A quantity of this resin (277 g.) was dissolved in ether and extracted successively with water, and with solutions of ammonium carbonate, potassium carbonate, and potassium hydroxide. The ether was then washed with water and the solvent removed. This *neutral constituent* weighed 116 g. or 42 per cent. of the ether extract. It is an extremely sticky substance and when warmed can be pulled into shiny, silken-like threads. It is very soluble in alcohol. In order to find out whether it was ester like, corresponding to the "resinotannolester" group of Tschirch, or a stable substance incapable of hydrolysis ("resene") estimations were carried out upon its saponification value.

1.898 g. boiled 0.5 hr. with 23 Cc. 0.5 *N* KOH (alcoholic) neutralized 0.3136 g. KOH. S. V. = .165.

1.898 g. boiled 1.0 hr. neutralized 0.333 g. KOH. S. V. = 175.5.

1.898 g. boiled 5 hrs. neutralized 0.3416 g. KOH. S. V. = 179.

It appeared, therefore, that some insight into the composition of this amorphous resin might be gained by hydrolysis. For this purpose 35.5 g. were dissolved as far as possible in 350 Cc. of 10 per cent. KOH, and steam was passed through the mixture for about one week. The liquid when acidified gave an oily precipitate, and the acid filtrate was examined for organic acids with negative results. Saponification with 20 per cent. KOH solution for a somewhat longer period gave no smooth reaction, although small quantities of volatile acids were detected as decomposition products.

Another portion (33 g.) was hydrolyzed by the method of Tschirch,[8] using at first sulphuric acid 1 : 2. After distilling with steam for 4 days, 0.915 g. of umbelliferon was obtained. The strength of the sulphuric acid was increased to 1 : 1 and after about ten days 3.86 g. further of umbelliferon was obtained. The total umbelliferon corresponds to 14.3 per cent. of the neutral portion. It gave the characteristic fluorescence with alkalies, and after recrystallizations from water, dilute alcohol, and ethyl acetate melted at 228°.

Calc. for $C_9H_6O_3$: C = 66.67, H = 3.7. Found : C = 66.86, H = 3.43.

The resin or ester is therefore somewhat similar to some other resins of the umbelliferæ such as galbanum, sagapen, asafœtida, which yield umbelliferon when thus hydrolyzed.

The ammonium carbonate extract of the ether extract of the resin was acidified and permitted to stand for some time when a quantity of tar separated. This was removed by filtration and the clear aqueous acid filtrate thoroughly extracted with ether. This solution was evaporated to dryness and dried *in vacuo* over sulphuric acid. When now it was digested with small volumes of anhydrous ether a white crystalline deposit remained, weighing 0.24 g. It was crystallized from water, whereupon it melted at 205–206°. It was dried for 2.5 hours at 125° and analyzed. The remainder was again recrystallized from dilute alcohol, whereupon it separated in needles and the melting point remained constant. This was dried at 115° and also analyzed.

I. 0.0853 g. subst. gave 0.1802 g. CO_2 and 0.0357 g. H_2O. II. 0.0641 g. subst. gave 0.1351 g. CO_2 and 0.0270 g. H_2O.

Calc. for $C_8H_8O_4$; C = 57.1 ; H = 4.8. Found: C = 57.61 ; H = 4.69, 4.73.

This acid appears to be vanillic acid (3-methoxy protocatechuic acid). This was further substantiated by the determination of the methoxyl group upon another small sample.

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[8] "Die Harze und die Harzbehälter," 1906, p. 342.

The potassium carbonate extract of the ether extract upon acidification yielded a tar which was removed by filtration. From the filtrate about 0.2 g. of umbelliferon was isolated. Recrystallized from hot water it melted at 226° and when a mixture of this product with the umbelliferon that was obtained from the glucoside by hydrolysis was melted, the melting point was 227°.

Calc. for $C_9H_6O_3$: $C = 66.67$; $H = 3.7$. Found: $C = 66.9$; $H = 3.7$.

When the potassium hydroxide extract was redissolved in alcohol it was impossible to obtain crystalline products even after the solution was stood aside for months. Thus the resinous extract weighed 143 g., equivalent to 52 per cent. of the ether extract. It showed no ester properties, and was in fact a resin acid. (Acid no. = 129.) A portion (106 g.) was dissolved in a large volume of ether and again extracted with solutions of ammonium carbonate and of potassium carbonate. The ammonium carbonate solution was acidified and a smear precipitated, indicating that the substances extracted with potassium hydroxide had undergone change. The filtrate from this smear yielded a quantity (0.1 g.) of vanillic acid that melted after recrystallization from water at 204–205°. A methoxyl determination was carried out upon this, by the Zeisel method as modified by Perkin.

Calc. for $C_8H_8O_4$: $OCH_3 = 18.4$ per cent. Found: 18.3 per cent.

The potassium carbonate extract contained a small quantity of umbelliferon.

The potassium hydroxide extractions were made with successive portions of 100 Cc. of a one per cent. solution. These were each washed once with ether and then acidified with hydrochloric acid and the sumbul resin acid was again extracted with ether. The ether was removed and the residues were dried in a vacuum over sulphuric acid. The first four extracts weighed about 12 g. each and the fifth to the tenth and last extract were smaller. Fourteen grammes of material could not be extracted with 1 per cent. potassium hydroxide solution. The fractions of this resin acid were examined and found to be mixtures, although they were all similar light-colored powders when dry and of a hygroscopic nature. When very slightly moistened with alcohol they became exceedingly sticky and resinous.

Fraction III. This was a typical product. It softened at 56–60° and became translucent at 63°, and decomposed with effervescence at 75–85°. It was analyzed: C = 72.3 per cent.; H = 8.1 per cent. It had an acid number of 118–122, and was optically active.

0.474 g. made up to 50 Cc. with 95 per cent. alcohol showed a rotation of —1.18° in a 2 dcm. tube, whence $[\alpha]_D^{21.5} = -62.2°$.

Fraction IV. This fraction softened at 50° and was completely translucent at 53°. It effervesced at about 80–90°. Analysis showed: C = 73.3 per cent.; H = 8.2 per cent.; acid number = 123.

0.3942 g. made up to 20 Cc. with 95 per cent. alcohol showed a rotation of 2.22° in a 2 dcm. tube, whence $[\alpha]_D^{19} = -56.3°$.

Fractions V and VI. The optical rotation was taken.

V. 0.4293 g. made up to 20 Cc. with 95 per cent. alcohol showed a rotation of 1.98° in a 2 dcm. tube, whence $[\alpha]_D^{20} = -46.0°$.

VI. 0.7665 g. made up to 20 Cc. with 95 per cent. alcohol showed a rotation of 1.56° in a 1 dcm. tube, whence $[\alpha]_D^{22} = -40.6°$.

It is therefore obvious that this sticky acid of a resinous nature, which forms a most conspicuous part of sumbul extract and gives the latter its disagreeable properties, is not a homogeneous body. The presence of vanillic acid in the solution after prolonged standing of the alcohol solution suggested that this phenolic acid represents a part of the structure of the complex resin and a methoxyl determination of the resin acid further indicates this.

Subst. 0.1918 g.: CH_3I = 0.0641. Found: OCH_3 = 4.4 per cent.

Vanillic acid was prepared from this resin acid as follows: thirteen grammes were boiled for several hours with 5 per cent. alcoholic sulphuric acid. The alcohol was removed by steam distillation. The steam distillate contained a small amount of a blue oil resembling the essential oil.

The contents of the flask were shaken with ether, which was then extracted with solutions of ammonium carbonate, potassium carbonate, and potassium hydroxide. From the first of these extracts vanillic acid melting at 205–206° was isolated. The weight was 0.5 g. The potassium carbonate extract yielded umbelliferon (0.05 g.) melting at 225–227°. Nothing definite could be isolated from the potassium hydroxide solution.

The chloroform extract of the resin (46 g.) was divided into two parts. The first (26 g.) was redissolved in chloroform and extracted with the various alkaline solutions, but nothing definite could be separated by this process. Most of the material was extracted with potassium hydroxide solution. Twenty grammes were hydrolyzed with 5 per cent. alcoholic sulphuric acid. Umbelliferon (0.85 g.) melting at 226–227° was isolated. This was present in glucosidic combination, as 1.5 g. of *d*-phenyl glucosazone melting at 206–207° was isolated.

The ethyl acetate extract of the resin (19 g.) was a dark-colored resinous product. Upon hydrolysis a small amount of umbelliferon melting at 226–227° was isolated, but sugar was not formed. The material is therefore not glucosidic.

The alcohol extract of the resin (18 g.) agreed in its properties with the brown glucosidic powder isolated from the amyl alcohol extract of the constituents soluble in water. Umbelliferon and a reducing sugar were found as products of an acid hydrolysis.

Kalamazoo, Mich.

QUARTERLY REVIEW ON THE ADVANCES IN MATERIA MEDICA AND PHARMACY.

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The U. S. Pharmacopœia.—The outstanding event since the last quarterly was written is undoubtedly the appearance of the Pharmacopœia of the United States, Ninth Revision, and the appearance at practically the same time, of the National Formulary, Fourth Edition. While it may be undoubtedly true, as some critics contend, that both books were a long time in the making, and particularly the Formulary, now that they are in our possession, and we study their contents, it is readily realized that the exigencies caused by the enactment of the Food and Drugs Act of June, 1906, when these two books were made the legal standard for drugs, required that this revision be approached from an entirely different viewpoint. Making these two books the legal standard for drugs and medicines had a very stimulating effect in altering the viewpoint of manufacturers and others. Whereas in former revisions it was wellnigh impossible to obtain information from them, which might be useful to the committee on revision, in the present revision all were only too willing to render assistance and furnish information. To give them all a hearing and treat them with that spirit of fair play which is characteristic of us Americans was also undoubtedly time-consuming and, in a measure, made for delay. However the books are here and even a cursory reading of them will disclose that they are a distinct improvement over their predecessors.

The use of the abbreviation "mil" in place of Cc. will probably be somewhat embarrassing for a time, particularly to workers in institutions. The metric system is just about beginning to take hold despite the fact that it has been official in this country for years; and it may be burdensome to be constantly explaining to doctors and nurses and others that five mils or ten mils, as the case may be, does not mean five or ten milligrams, but cubic centimeters. For some of us this condition has already begun. As the difference between the thousandth part of a liter and the cubic centimeter is very nearly a theoretical one, the term Cc. could just as well have been retained.

It is gratifying to see that the revision committee followed the instructions of the convention as to the desirability of giving microscopical descriptions of powdered drugs. This is as it should be. Indeed the Pharmacopœia would fall far short of being a legal standard if it had failed to give these requirements for the detection of adulterations. The descriptions of what the powdered drugs of the Pharmacopœia should look like under a microscope show care and thoroughness in the highest degree. The language is clear and unmistakable and persons interested in enforcing these requirements will have no difficulty in finding what a certain powdered drug should look like, either macroscopically or microscopically.

Perhaps the most important innovation to be found in the Ninth Revision is the giving of methods for the biological assaying of drugs for which it is impossible to determine activity by the ordinary chemical means. The drugs for which methods of assay are given are cannabis, aconite, the digitalis series (digitalis, strophanthus, squill) and suprarenal gland. For the assay of members of the digitalis series the commonly used "one hour frog" method is advised. With the exception of cannabis, the assay of which is compulsory, likewise its preparations, the others are merely optional.

Another innovation, one entirely in keeping with the spirit of progress, is a chapter on sterilization. The information given on this important subject is rather brief and rudimentary, yet sufficient for most problems the everyday, busy pharmacist may be called upon to solve. In this connection it may not be amiss to call attention to the fact that the revised National Formulary also contains a chapter on sterilization and one that goes a little more fully into the subject.

It is frequently the experience of pharmacists to have calls from their physician friends for information and material for the making of various reagents and test solutions to be used as aids in establishing a diagnosis. And it many times happens that the information required is so widely scattered in the various text-books that it is almost impossible for the pharmacist to assemble it for ready reference. The revision committee has taken cognizance of this and in the present Pharmacopœia nearly ten pages are devoted to valuable information concerning diagnostical reagents and clinical tests.

Alcoholic liquors, such as brandy, whisky, and white wine, have been dropped from the revision, and so have all of the medicated wines. The latter, however, have been entered in the National Formulary, and white wine is recognized in Part Second of the Formulary as Vinum Xericum (Sherry Wine).

The popularity of powdered extracts has been recognized and this class of pharmaceuticals greatly enlarged; the advantages of the powdered over the solid extracts from the standpoint of dispensing are well-known to busy pharmacists, and this change will be greatly appreciated by them.

Keeping always in mind the fact that the book is looked upon by many as a book of standards, the committee has also greatly enlarged the number of assays. No pharmacist should experience any difficulty in performing these as the methods given are invariably simple and easy of execution.

The custom of having in the front of the book a comparative table showing the strength of the more important pharmacopœial substances and preparations, in the preceding and in the present Pharmacopœia, is continued. The number of pages for this table has been increased. This custom is a most desirable one, as it enables the pharmacist to prime himself very easily with information that will frequently be demanded from him by physicians.

The fore part of the Pharmacopœia contains six pages devoted to a comparison of International Protocol drugs and preparations with similar drugs and preparations of the Ninth Revision. This is in the form of a table, and will be found to be a great convenience to the pharmacist as it will enable him to see at a glance what the

P. I. demands as to titles and requirements and how closely the U. S. P., Ninth Revision, follows them. By way of illustration we give this about digitalis:

DIGITALIS	P. I.	U. S. P. IX
Digitalis purpurea (L.)		
Title	Digitalis folium seu Folium Digitalis	Digitalis
Requirement	The leaf of the second year	Assayed biologically. Leaf of second year not required.
Tinctura digitalis		
Title	Digitalis tinctura seu Tinctura Digitalis	Tinctura Digitalis.
Strength	10 per cent.	100 mils from 10 Gm. (approx.).
Menstruum	Alcohol, 70 per cent.	Alcohol, 75 per cent.
Requirement		May be assayed biologically.

Thirty-five drugs and preparations are listed in the above manner and, as can be noted, the standards of the Protocol are not literally adhered to. Of course, the questions of standards and proper menstruums for the exhaustion of drugs will always be more or less debatable ones. Making due allowance for this, we believe that the question of international standards will, in time, be satisfactorily solved. Take the question of when the leaves of digitalis should be gathered; in this country it seems to have been pretty well establishd by biological examination that the leaves of the first-year growth are as active as those of the second or third. The P. I. requires aconite to be the tuber of the current year, while in this country it has been determined that this requirement is not necessary.

The admissions to the Pharmacopœia number 67; this includes Aqua Destillata Sterilisata. Atophan has also been made official under the name Acidum Phenylcinchoninicum. Although this synthetic enjoys no patent rights, it has all the advantages that go with a U. S. trademark. This virtually gives the foreign firm that manufactures it and puts it out in this country under its coined name, a monopoly; and it is only under such coined name that physicians know of it. It will be a long, long time before the physicians of this country ask or write for it under its official name or abbreviation. At the present time is is impossible to obtain this chemical on account of the war. If the pharmacopœial text or definition of this drug contained the words "Acidum Phenylcinchoninicum, a name applied to Atophan" or, better still, gave the name "Atophan" as a synonym, perhaps it would have been some inducement to American chemical manufacturers to supply the public with this drug, at least during the war. Previous to the war it was selling at $1.40 an ounce and at this price a handsome profit certainly must have been the maker's reward.

While the book still contains many drugs that advanced thinkers in medicine regard as obsolete, yet some two hundred and fifty articles have been deleted. This may not be progressing as rapidly as some would wish toward the goal of simplicity in the prescribing of medicines to the sick, yet it will be regarded by those who believe in going forward slowly and giving consideration to all interests, as quite a concession, and one that is in keeping with the times.

Of course the greater number of the dismissed articles were promptly put into the National Formulary, so they will always be available to those physicians who may think that they need them in the practice of medicine. There would be little loss to humanity if they were all allowed to rest forever in innocuous desuetude.

The general principles laid down by the Pharmacopœial Convention for the guidance of the committee on revision have been closely adhered to. Every page gives evidence of this fact, and the result is that the American pharmacist has a Pharmacopœia for his guidance and the safeguarding of his calling, and, one might say, the protection of the public, that is second to none.

The National Formulary has been considerably enlarged, the volume now numbering 394 pages, this giving it 127 pages increase over the third edition. The custom of making the Formulary the repository of all articles and preparations discarded from the Pharmacopœia accounts for this, but not wholly. The legalization of the book, as we mentioned before, made it necessary that the revision must be made from the viewpoint of standardization; consequently, the drugs and chemicals used in this book had to have standards provided for them, it rightfully being conceived unthinkable that another book should be referred to as containing the standard for a chemical, drug, or preparation, as had been done in previous revisions of the Formulary. This accounts for the further enlargement of the volume, Part Second of the book consisting altogether of standards of drugs and chemicals used in the various formulas in Part

One, 98 pages being devoted to excellently written descriptions and standards to the number of 188. These monographs are a creditable piece of work.

Part Three consists of special tests and reagents. Tests are given for arsenic, including Bettendorf's test, heavy metals; assay for bromides, chlorides, or iodides; assay for alkali salts of organic acids; determination of ash or non-volatile matter; determination of crude fiber, etc.

With the exception of the number of pages, which, of course, is considerably more, the book resembles the Pharmacopœia very much, so closely does it follow the nomenclature, descriptions, and general style of that book.

A serious attempt has been made to improve many of the formulas. We presume that the committee on revision found that Elixir Digestivum Compositum was beyond improvement, as we find no trace of this much-discussed preparation in the present revision. It is probably among the "dropped." There were 183 formulas discarded, among them Magma Magnesia; this preparation has, however, been inserted in the Ninth Revision. Just why the pharmacopœial committee evinced such regard for it, it is impossible to say. The committee not only abstracted it for its own but completely altered the procedure for making this popular preparation.

We have looked in vain among the 183 "dropped" formulas to see if our old friend Warburg's Tincture, scientifically (?) known as Tincture Antiperiodica, had met such a fate. If ever a preparation deserved to be cast into the limbo of oblivion surely this is it. It has two glaring faults, faults that modern pharmacy cannot afford to countenance, namely: a therapeutic title and "polypharmacy." Discarding a preparation of this type would not invoke any more hardship than the other discarded ones might; any time the formula might be needed all that would be necessary would be for the pharmacist to refer to the previous edition of the National Formulary. And surely the average pharmacist has that much intelligence! It is hard to fathom why the committee failed to arise to the occasion.

Although 23 elixirs have been discarded, no physician need ever be at a loss as to prescribing any of this class of preparations, as the book contains 76, although this is twelve less than before. We shed no tears when we allowed our glance to wander over the twelve plus eleven and realized their utter uselessness. The elimination of twelve fluidextracts was also regarded by us with considerable complacency. Indeed, we must commend the committee for the stand it took when it ordered the dropping of 183 formulas. It augurs well for the future.

We cannot help but deprecate the large number of petrox preparations the book contains. The efficacy of this class of preparations, we fear, has been greatly over-rated. If a physician wishes his patient to have iodine by local absorption surely five per cent. in liquid petrox should, and does, answer every requirement. So why the presence of Petroxolinum Iodoformi? What possible use can a liquid petrox containing three per cent. of sulphur have? And a Compound Sulphurated Petrox, which has only 0.3 per cent. of sulphur? And why a Venice Turpentine Petrox? Why a Tar Petrox? When a doctor wants to use tar locally, he prefers an ointment, and so will his patient after one experience with a greasy liquid.

Unquestionably an ointment is the ideal method of application for this drug. There are twenty of this class of preparations in the book. We would advise that pharmacists only make these preparations as called for. This is particularly desirable for those containing iodine.

A class of preparations has been introduced called "nebula." These are oil sprays with Light Liquid Petrolatum as the vehicle or base. They should prove immensely popular with physicians once they get to know about them from the retail pharmacist. Indeed, there are many things in this interesting book that the physician should know about, and, undoubtedly, would be pleased to hear about them if pharmacists would only take the time and trouble to bring them to his attention. We think that in order to do this successfully, however, the pharmacist must show a nice discrimination in his choice of the preparations he would "talk up" to his physician friends.

It certainly is to be regretted that the committee on revision did not see fit to place Decolorized Tincture of Iodine among the "dropped" ones. Surely, among the group of eminent pharmacists who comprised the committee there were those whose chemical knowledge must have whispered to them that the title is a misnomer and the preparation an absurdity! This is one of the preparations that the retail pharmacist had better not call to the attention of his physician friends.

We cannot help but feel that in the past the National Formulary has been regarded more or less as the scrap-heap for formulas and preparations from all sources. The time will soon be here, if it has not already arrived, when the use of this book as a scrap-heap for discarded formulas and preparations from the United States Pharmacopœia must cease. We are prompted to this remark by looking over the list of fluid extracts dropped from the Pharmacopœia and promptly made part of the National Formulary. Practically all of these are worthless from a therapeutic standpoint, and, for this reason were dropped. If they were worthless from a therapeutic standpoint for inclusion in the Pharmacopœia they surely were worthless from the same standpoint for inclusion in the National Formulary! To that it will probably be replied that it was necessary to put them there so that there be a record of them. But this is not so; they would always be available to those who might want to use them. Then again we often hear it said that somewhere in the country there are some physicians who use these obsolete preparations and we must have a standard for them. This again is a poor argument, no argument at all! They would always be available and the source from which they were obtained would also contain a standard and would, we believe, be regarded as a legal one.

We think that the National Formulary is a good book and to a great extent answers the needs of the pharmaceutical profession. And it may be that it answers the needs of the medical profession. We do not know positively as to the latter. It could, however, be made a more potent influence for good to the medical profession if it were more educational. There is no reason why the National Formulary should not undertake to teach prescribing to physicians.

Both the Pharmacopœia and the National Formulary should be representative of the time and period in which they are issued; to be this they must also be educational, and to be educational they must reflect the best thought and endeavor of the professions of medicine and pharmacy.

Spices as Preservatives.—Experimental work of a bacteriological nature discloses the fact that the value of most of those articles that we refer to as spices have very little preservative or antiseptic power. It was found that when cinnamon, cloves, or allspice are used in large amounts the development of moulds may be retarded; in conjunction with vinegar the spices show greater antiseptic power. The writer thinks that the cinnamic aldehyde, which is the active principle of these spices, might be used in dilutions to be of value in preventing the growth of many microorganisms and yet sufficiently weak so as not to interfere with the flavor of the article preserved. It was found that pepper and nutmeg have very little retarding effect on the growth of micro-organisms, although cinnamon was found to be quite effective for this purpose. Experiments with alcoholic solutions of the essential oil from these spices proved that cinnamon is the most effective for preservative purposes, followed in order by cloves and allspice. The author also found that bacteria appear to be less sensitive to the action of spices than moulds. (*Jour. Ind. Eng. Chem.*, 1916, 8620, by Freda M. Bachmamn.)

A Fatal Case of Poisoning With Ammonium Sulphocyanide.—This chemical is commonly regarded as being harmless but there is record of some cases of poisoning after takirg large doses of the salt although without death as a sequence. Recently death followed the taking of a large amount with suicidal intent. (*Jour. Pharm. Chem.*, 1916, 14, 87.)

Inositol in Brain Matter.—It is possible to extract this substance from the human or ox brain by extracting it with acetone. The acetone is then gotten rid of by distillation and the residue precipitated, first with neutral lead acetate, then with basic lead. The inositol is obtained from the second precipitate. It is the same as that found in plants—*i*-inositol. (*Chem. Soc. Abstr.*, 1916, 110, 523.)

Cause of Variation in the Radium Emanation Content of Spring Water.—Measurements made weekly over a period of nine months elicited the interesting information that the radio-activity of two springs in Indiana increases and decreases as the flow of water is greater or less. It is reasonable to suppose that these facts, and the further information that the highest values for radium emanation were obtainable from "wet weather" springs a short time after very heavy rain falls, logically point to the conclusion that the surface water, in percolating through the soil, dissolves and carries down with it some of the emanations which is constantly moving upwards from the earth centre to the surface. During the dry weather, of course, when the pressure of the water is not so great and the flow considerably less, a large proportion of the dissolved emanation is changed into products and lost, before the water issues from the ground. (R. R. Ramsey, *Phys. Review*, 1916, 7.

284; *Chem. Abstr.,* 1916, 10, 1811, through the *Pharm. Jour. & Pharmacist,* Sept. 2, 1916.)

Identification of Croton Oil.—The following is suggested as a means of showing the admixture of other oils with that of croton: The sample of oil is shaken with twice its volume of absolute alcohol; the clear solution is then layered on to a highly concentrated solution of potassium hydroxid in a test tube, this mixture is then warmed for thirty minutes in a boiling water-bath and allowed to stand. At the point of contact of the two liquids, an intense reddish-brown or reddish-violet ring forms. This reaction is stated to be very characteristic. (*Jour. Pharm. Chem.,* 1916, 14, 38, by J. Cante, through *The Pharm. Jour.& Pharmacist.*)

Pure Sodium Chloride.—Common salt that is free from potassium chloride is practically unobtainable, even those packages labelled "C. P."are not true to label. Examination of samples purified according to various accepted methods have shown the presence of potassium chloride to the extent of 0.27 to 0.48 per cent. Some samples labelled chemically pure were shown to contain as much as 0.45 to 0.57 per cent. The presence of the potassium could be plainly made out or seen with the flame test, using a piece of blue glass. The process used for separating the sodium and potassium chloride is as follows: About 0.5 grams of the salt is dissolved in a little water, and about 1 mil of a 10 per cent. solution of platinic chloride added. A few drops of water are added, and the mass moved backwards and forwards until it flows readily. Care must be taken in this, as too little water fails to dissolve all the $NaPt_2Cl_6$, and too much dissolves some K_2PtCl_6. The mixture is then filtered and then washed first, 5 or 6 times with a mixture of one volume of water and a half volume of alcohol, then with a mixture of alcohol and ether for six washings. After drying the precipitate it is placed over a weighed platinum crucible and washed into the crucible with boiling water. (C. Lohman, *Chem. News,* August 4, 1916, 53.)

Grapes as an Article of Food, and as a Dietetic Preservative.—It is claimed that the unfermented juice of the grape, and the pulp, when mixed with meat which has first been ground, blood, and yolk of egg, and even milk, seem to modify the protein, seemingly making it more digestible, as well as increasing its keeping properties. While the preservative action of grape juice is hard to account for yet it is sufficiently effective to open up an important field of application to commercial dietetics in grape-growing countries. It is suggested by the author that many new foods may be prepared in this manner. (E. Bertarelli, *Jour. Amer. Med. Assoc.*, 67, 243, 1916.)

TREATMENT OF HAY FEVER.—The results of the treatment of hay fever with pollen solutions and calcium chloride have been noted, 26 cases with the former and 22 with the latter; it is brought out in this note that the decrease to susceptibility of hay fever is markedly noticeable in a small percenltage of victims if this means of treatment is begun early enough. Great stress is laid on the fact that much care and understanding is necessary in the preparation of these solutions for therapeutic use. If not properly made or used very serious, and perhaps fatal, reactions may occur. In the use of calcium chloride, on the other hand, and which rests largely on empirical observation, if large enough doses are given and begun very early and over an extended period of time, a large number will receive marked benefit. The use of calcium salts is without any danger and can be easily given by the general practitioner. It is also noticeable that the spring variety of hay-fever is more amenable to treatment than the autumn. (H. Wilson, *Jour. Amer. Med. Assoc.*, 1916, 318.)

SOUTH AUSTRALIAN OLIVE OIL.—Olive oil from Australia is said to be of very superior quality and its production increasing every year. The production is sufficient to supply all of that country and quite a quantity of it is shipped to England. Those interested in this industry in that country have every reason to be optimistic. (*Australas. Jour. Pharm.*, 1916, 31, 284.)

PLEUROTUS JAPONICUS.—This is a fungus that is luminous and very poisonous. Its growth takes place on the decaying trunks of the beech trees in Japan. Recent study shows that the light is emitted from the gills, and that these are luminous all over; also that the range for luminosity is 3°—40° C. It is stated that 100 square centimetres of luminous area gives light enough for reading and the light can be noticed for a distance of 30 metres. The toxic properties of this fungus are not destroyed by heating. (Katamura, *Jour. College Sci.*, Tokyo, vol. XXXV, 1, through *Nature*, 1916, 504.)

FORMALDEHYDE IN PRURITUS ANI.—The discomfort and annoyance accompanying this condition are such as to prompt one to use almost anything recommended for its treatment. The author advises the use of a starch jelly containing from one to two per cent. of formalin (that is the official solution of formaldehyde gas). The jelly is preferable to a greasy ointment. If the application should prove too irritant it is more readily washed off; it is said when this is done the sting at once disappears. The writer has used this preparation in many cases, even chronic ones, and always with success. It seems to be much better than treatment with iodine, and compares very favorably with X-ray treatment. (*Brit. Med. Jour.*, 1916, 244, J. Cropper.)

BOOK REVIEW.

Annual Reports of the Chemical Laboratory of the American Medical Association, Volume 8, Jan.–Dec., 1915.—This handy little volume contains much that is of interest to a pharmacist. Perhaps one of the most interesting is a report on "The Quality of Commercial Blaud's Pills." This report takes up the claims made for some of the ready made tablets and soft-massed pills as to solubility and ferrous carbonate content. Considerable variation was shown to exist in regard to solubility, and especially was this variation shown to be considerable among pills of the same make and same brand. It is admitted in the report that the commonly assumed instability of ready-made Blaud's pills is without fact and that the assumption that so-called "nascent" preparations, soft-mass pills, and gelatine capsules with oily suspension of this chemical, are superior to the ordinary pill, is without warrant or fact! However, it is advised that physicians will do better for their patients if they insist that the pharmacist make the pills freshly according to the U. S. P. whenever they are ordered by the physician.

Much valuable information is contained in the report of "An Examination of Several Commercial Specimens of Opium Alkaloids or Their Salts." This is most comprehensive and embraces a number of desirable features, among others a chart showing color reactions of some of the opium bases.

One very admirable feature of these chemical reports is the fact that very detailed descriptions are given of the methods of analysis and technic followed in the investigation of the substances under examination. This feature should make them of inestimable value to pharmacy students, for they show clearly that keen observation and painstaking attention to details is requisite in drug analysis; without it there can be no work of real value accomplished.

In the preface it is stated that "the reports of the Laboratory are published in order that its findings may be readily available to those who are interested in the composition of medicines, namely, drug analysts, food and drug authorities, pharmacists, and others."

JOHN K. THUM.

COMPLIMENTARY DINNER TO PROF. SAMUEL P. SADTLER.

To graduates of the Philadelphia College of Pharmacy, and especially to Prof. Samuel P. Sadtler, Wednesday, September 6, 1916, will long remain the red-letter day of the Convention of the American Pharmaceutical Association held during the week of September 4th in Atlantic City.

The Alumni Association of the Philadelphia College of Pharmacy and friends of Dr. Sadtler selected the evening of this day to pay a well-deserved tribute to one who, after 38 years of active teaching of chemistry at the Philadelphia College of Pharmacy, has decided to take a well-earned rest from this phase of his manifold activities.

A complimentary dinner to Professor Sadtler had been arranged at the Hotel Traymore on this evening, and was attended by many former students, and friends of the honored guest, who had come from all parts of the country to attend the sessions of the American Pharmaceutical Association. A special excursion of Philadelphia druggists to "America's greatest seashore resort" also brought a large number of local alumni and friends to this spread.

Prof. Joseph P. Remington was the toastmaster of the evening and as is customary, played his rôle to perfection. He first called on President Howard B. French who complimented Dr. Sadtler on his fruitful efforts expended in the capacity of a teacher at the Philadelphia College. Mr. French also took occasion to announce to the assembled gathering the merger of the Medico-Chirurgical College Department of Pharmacy with the Philadelphia College, and welcomed the members of the "Chi" alumni and faculty who were present.

Professor Remington then called on Dr. P. Samuel Stout, Chairman of the Centennial Fund Committee of the Alumni Association, who in a few words paid a tribute to Dr. Sadtler, speaking as a former student and member of the Alumni Association, and then on behalf of the Association presented the guest of the evening with a beautiful umbrella suitably engraved on the handle, and a bouquet of American Beauty roses. Dr. Sadtler was overwhelmed and when called upon by Professor Remington to speak he was given an ovation which lasted several minutes. Dr. Sadtler spoke as follows:

I desire first of all to express my appreciation of the kindly feeling which has impelled so many of my former students and associates to gather together in this way to show their affection for me.

The beautiful gifts which Dr. Stout has just presented on behalf of the Alumni have also touched me greatly, as they were entirely unexpected and have come as a complete surprise.

As a matter of interest I would like to recall the circumstances under which I became connected with the Philadelphia College of Pharmacy in 1878. I was a young Professor of Chemistry at the University of Pennsylvania delivering the lectures on General Chemistry to undergraduates at that institution. Among my students at that time were the sons of the well-known drug firm, Bullock & Crenshaw, and Mr. Chas. Bullock the head of that firm was at that time the first Vice-president of the College. I suppose he got from the young men a favorable report as to my qualities as a lecturer, and one day I was surprised to receive a call from him at my room at the University, and he made the proposal on behalf of the authorities of the College that I come down that fall and take the position of an assistant to Dr. Robert Bridges, the Professor of Chemistry, delivering the lectures on Chemical Physics and Elementary Chemistry to the Junior Class while Professor Bridges continued to lecture to the Senior Class. After the Christmas holidays he gave up these lectures to me also, and in the spring was made Emeritus Professor. An election was then held for the succession to the Chair of Chemistry. There were two candidates of whom I was one, and I was chosen. The rival candidate, with whom I have been thrown into close acquaintance by professional services in recent years, has since told me, in answer to my question as to whether he recalled the contest, that he considers himself fortunate in escaping the teaching career for he has been exceptionally successful in business and is now the head of several large manufacturing companies.

On the other hand I consider myself fortunate in the connection I then established and which has continued during these 38 years. I severed my connection as Professor with the University of Pennsylvania in 1891 in order to be free to go into practice more fully as a chemical expert, but I retained my place in the Philadelphia College to this present year, as I enjoyed my work as a lecturer and teacher. But as a man gets on in years he comes to realize that there is a limit to his strength and he has to let up somewhere on his undertakings. So I concluded to make way for a younger man in my teaching work.

I feel satisfied that I have gained greatly in my understanding of technical chemical problems and possibilities by my having been obliged to take up and study pharmaceutical chemistry. I am satisfied too that the graduate in Pharmacy who has had a course of training such as he must have to make his degree at the Philadelphia College of Pharmacy is especially qualified to go on successfully with chemical work and has laid a good foundation for a career as a manufacturing chemist. I say this with the benefit of contact with and observation of young men in University classes as well as those in our school of Pharmacy. The young man who is a diligent student in a course such as we offer has had by the time he graduates a drill in the methods by which successful manufacturing is to be worked out when translated to wider fields.

I desire here to pay a tribute of respect and affection to the men with whom I first became acquainted when I took hold at the College of Pharmacy. My predecessor, Dr. Robert Bridges, was a quiet unassuming man with a wide acquaintance with the field of chemistry as it had been developed 40 years ago. Next in seniority was Prof. John M. Maisch, a man that all of the older people here present recall as one of the great names in American Pharmacy, and it was a sincere pleasure to me to be associated with him and to be able to discuss scientific questions with him, as he was an exceptionally well informed and many sided teacher. When I came to the College he had charge of the Chemical Laboratory which offered an optional course of study in analytical chemistry to such students as desired extra work. Of my relations with the next of the old Faculty of 1878, the present honored Dean of the College who sits now at my side, I cannot speak in the past tense. Those relations have been close and cordial for all of these years since I joined the

College Faculty and I hope they will continue for as many years as we are spared in this mundane sphere, wherever we may locate or whatever we turn to for occupation.

When I began as teacher at the College and for a year previous at the University I had as my lecture assistant a young man of great intelligence and industry. This was Henry Trimble who later, when Dr. Frederick Power had taken over the direction of the Chemical Laboratory from Professor Maisch for one year, left us to go to the University of Wisconsin, succeeded to the Professorship of Analytical Chemistry. He was a man of wide and accurate information and, above all, a lovable character with whom it was a pleasure to be associated in daily routine. After his untimely death while yet in middle age, the care of the Analytical Laboratory went for a year into the hands of his assistant, Mr. Josiah Peacock. and then under the control of my lecture assistant, F. X. Moerk, who is still "holding the fort" and turning out every year young chemical graduates whose thorough training is attested by the readiness with which they find responsible positions. I am tempted to contrast the course which was offered by the old Faculty of three with the instruction given now by a Faculty of eight together with as many instructors. I would say that what it lacked in breadth it sometimes gained in intensiveness and that more was left to the initiative of the individual. That they "got there," despite what we would now call the elementary facilities offered, is attested by the success of our prosperous Alumni of the past generation who are here represented. There is some danger of superficiality of attainment being the result when a student's time is spread over too many studies in an obligatory course, and it is frequently best to concentrate upon a group of cognate and related branches rather than to try to divide upon all subjects equally.

I cannot omit, however, to emphasize the fundamental value of chemistry to the pharmaceutical student, whether he would become a successful pharmacist or work his way over into the medical profession or go into manufacturing. We have in this country now the largest Chemical Society in the world, the American Chemical Society, with a membership of 8200, publishing three chemical periodicals which are read by chemists all over the world. The present terrible war in Europe and its direct and indirect results have brought the public to realize that this is the day for the chemist, and a country's development and advance is largely in his hands and dependent upon the degree to which he is brought forward and put to work upon the great problems and undertakings of the country.

In conclusion, as I look back on 38 years of service as teacher at the College, I have a great satisfaction in the association I had with my former students and the feeling that I was able to be of help to them, and I prize greatly the acquaintances and friendships thus formed.

I hope to still keep up my connection and interest in the College, although no longer active in the classroom.

President Otto Kraus of the Alumni Association was next called upon and he conveyed the good wishes of the Association to Professor Sadtler. He was followed by Prof. J. W. Sturmer, who was presented to the Alumni as the new Associate Dean of the College. Dr. Sturmer responded in a few well-chosen words, expressing the pleasure of the Medico-Chi contingent at being present to help do honor to one whose service in the ranks of Pharmacy had been so long-continued and successful.

Other speakers of the evening were Dr. James H. Beal, Prof. F. X. Moerk, Dean Graves of the Department of Education of the University of Pennsylvania, Prof. Henry Kraemer and W. H. Cousins. Prof. Frank Graves represented Provost Smith of the University of Pennsylvania, who was unable to be present. He spoke of the fact that Dr. Smith and Dr. Sadtler had been colleagues on the University faculty and in fact had been teaching the same subject at this institution. This, said Dr. Graves, was only one of the many links of friendship between the Philadelphia College and the University. Professor Kraemer in a few stirring remarks called attention to the many excellent qualities which had made Professor Sadtler famous as an investigator and scientist and loved as a teacher.

The evening closed with the singing of "Auld Lang Syne" by the assembled gathering, and those present then conveyed their good wishes to Professor Sadtler in person.

The Committee in charge of the dinner included the following: Howard B. French, Otto Kraus, Walter V. Smith, Theodore Campbell, Charles Rehfuss, Joseph P. Remington, Freeman P. Stroup, Warren H. Poley, Dr. P. Samuel Stout, W. L. Cliffe and Joseph W. England.

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